REVISED FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED UMSINDE EMOYENI WIND ENERGY FACILITY

PHASE TWO

WESTERN AND NORTHEN CAPE PROVINCES

DEA REF: 14/12/16/3/3/2/687

On behalf of
EMOYENI WIND FARM PROJECT (PTY) LTD

February 2018

Prepared By:

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Registered in South Africa No. 2015/416206/07

THE PROPOSED UMSINDE EMOYENI WIND ENERGY FACILITY

Emoyeni Wind Farm Project Proprietary Limited (EWFP) is proposing the development of the Umsinde Emoyeni Wind Energy Facility (WEF), and associated infrastructure including grid connection infrastructure (the proposed development), located near the town of Murraysburg in the Western Cape. A small portion of the proposed development site (which comprises the WEF site and the grid site) transcends into the Northern Cape Province.

There are four components to the proposed development, representing two development phases:

- Umsinde Emoyeni WEF: Phase 1
  - Electrical Grid Connection and Associated Infrastructure for Umsinde Emoyeni WEF Phase 1
- Umsinde Emoyeni WEF: Phase 2
  - Electrical Grid Connection and Associated Infrastructure for Umsinde Emoyeni WEF Phase 2

The location of the WEF site is shown on Figure 1.1 and the specific boundaries of the WEF site on Figure 1.2. It should be noted this site boundary includes the total area within which the proposed development may be developed. The footprint of the proposed development will only occupy a small portion of the land within this boundary.

Each WEF development phase will comprise a maximum of 35 wind turbines, up to the a maximum installed capacity of of 147MW Turbines will have a maximum height to blade tip of 210 m will be considered (a hub height up to 135 m, rotor diameter up to 150 m). Both Phase 1 and Phase 2 of the WEF will be located within the WEF site boundary (Figure 1.3).

In addition to the Umsinde Emoyeni WEF, EWFP also proposes obtaining Environmental Authorisation from the Department of Environmental Affairs (DEA) for Eskom Transmission and Eskom Distribution Grid Connection Infrastructure for the required grid connection infrastructure. If an Environmental Authorisation for the grid connection infrastructure is granted, this may be entirely or partially transferred from EWFP to Eskom Holdings SOC Limited (Eskom) as applicable post construction. The grid connection infrastructure will be routed from the substation within the WEF site boundary and ultimately connect to the existing national grid at the Eskom Gamma Substation.

Through discussions with the Department of Environmental Affairs, it was decided that the combined process carried out during scoping will not be appropriate for the EIA phase. Therefore, each application already submitted to the DEA for each of the four components, has its own environmental impact assessment report, and management programme.

This report focuses on the Umsinde Emoyeni Wind Energy Facility Phase 2, though they may be references throughout the report, of the other phases mentioned above.

EXECUTIVE SUMMARY

Proposed Development

Emoyeni Wind Farm Project (Pty) Ltd (the applicant) is proposing the development of the 140 MW Umsinde Emoyeni Wind Energy Facility Phase Two, located near the town of Murraysburg in the Western Cape and Northern Cape Provinces. The proposed development will consist of up to 35 turbines, a hub height of 135 m, and rotor diameter of 150 m and the blade tip height of 210 m.

Project Background

Arcus Consultancy Services Ltd (Arcus) have been appointed to undertake the environmental impact assessment ("EIA") process, incorporating both the scoping and EIA phase, for the Umsinde Emoyeni WEF, including the proposed grid connection. The scoping process was conducted through a combined exercise for all four components of the Umsinde Emoyeni WEF, with each component being subject to a separate application for Environmental Authorisation to the DEA. One Draft Scoping Report (DSR) was prepared for all four components of the Umsinde Emoyeni WEF in June 2014 and subsequently went through public consultation. A Final Scoping Report (FSR) and Plan of Study for the EIA (PSEIA) taking into account comments received during the consultation period on the DSR was prepared in December 2014.

In April 2014, an application for environmental authorisation was submitted to the DEA. In December 2014 the Final Scoping Report was submitted to the DEA and was approved in April 2015.

In April 2016, the final EIA report was submitted to the DEA for environmental authorisation. The application submitted was for up to 98 turbines with each turbine having a generation capacity of between 1.5 MW and 4 MW.

During the public participation on the draft EIA report comments from BirdLife SA and the Black Eagle Project (BEP) were received. The applicant, the EAP and the bird specialist engaged with BLSA and BEP to discuss their comments and concerns on the project.

The main concern was the potential impact to Verreauxs' Eagle, should the development be authorised. BLSA and BEP recommended that an additional 12 months of bird monitoring be conducted on site. The additional monitoring followed the yet unpublished Draft Verreauxs' Eagle Guidelines and commenced in July 2016 and concluded in August 2017[1].

In September 2017, the DEA rejected the submission of the final EIA report submitted in April 2016. The EIA report was rejected due to non-compliance with Regulation 56(2) of the EIA Regulations, 2010 (the report was submitted on the same day to the DEA and interested and affected parties) (See Appendix C for the Refection Letter).

A meeting was held with the DEA to discuss the Letter of Rejection and the way forward for the application (Appendix C - minutes of Meeting with DEA). The DEA requested that a revised Final EIA report be submitted. This Revised report would require 30 days public participation for all registered I&APs and further specialist input where necessary.

As new information regarding avifauna in the area became available due to the additional 12 months of bird monitoring, and turbine technology changed since the submission of the report, the applicant decided to update the project description and revise the layout. The DEA advised that any new information must be contained in a Revised / Amended Final EIA Report and will still be subjected to the same 30 day comment and review period, as required in the Letter of Rejection (minutes of the meeting and the letter of rejection are included as Appendix C).

Project Layout Evolution

[1] The Final version of the Guidelines were released and published in March 2017.

The original layout consisted of 98 turbines. The applicant, after taking into consideration the findings and recommendations of the additional avifauna information, revised the turbine layout and reduced the number of turbines to 55.

This 55 turbine layout was provided to all specialists to review and to provide updated impact assessments. The specialists updated their assessments where necessary and provided revised buffer areas and no go areas of high sensitivity Through an iterative process that took into account all the recommendations and conclusions put forward by the specialists (including additional constraints, sensitive areas and no go areas) a Revised Final layout was produced, which consists of 35 turbines for Phase 1 of the development..

The specialists have all provided comment on the 35 turbine layout, in an addendum to their original reports (Volume III – Specialist Reports, Part 2).

Specialists Studies

During the EIA process, impacts on both the biophysical and socio-economic environments were assessed. The following specialist's studies were commissioned based on the sensitivities of the site, the potential impacts of the proposed development and in line with the relevant EIA Regulations:

- Visual;
- Terrestrial Ecology (Flora and Fauna);
- Bats;
- Wetlands and Freshwater;
- Birds;
- Soils, Land Use and Agricultural Potential;
- Heritage and Palaeontology;
- Noise; and
- Socio-Economic.

All specialists had the opportunity to review and comment on the revised layouts (both the 55 turbine layout and the 35 turbine layout). The specialists concluded the following:

The major change in the layout of the Umsinde Emoyeni Phase 2 is a significant reduction in the overall footprint of WEF as a result of a decrease in the number of turbines as well as a reduction in the required length of access roads. In addition, significant further adjustment of the turbine and access road locations has been conducted to reduce impacts as far as possible.

The proposed development of a wind energy facility on the site will have a small impact on agricultural activities as the soils are of very low potential and only suited to extensive grazing. The turbine footprints are limited to rocky and shallow soil areas with very limited grazing potential.

The impacts on the site need to be viewed in the context of the country's energy mix and the negative externalities associated with current dominant energy sources such as coal, often in areas of high potential soils – such as the Eastern Highveld and the pollution that they produce. Indeed wind energy is associated with positive externalities in the form of rural Economic Development benefits distributed across regions and a decline in the tariff at which power is sold to the off-taker.

The potential noise impact was evaluated using a sound propagation model. Conceptual scenarios were developed for a construction and operational phase. The output of the modelling exercise indicated that there is low risk of a noise impact (low significance during all phases of the development).

While the new layout was not modelled, the closest wind turbines are located further than 1,250m from the closest potential noise-sensitive receptors, further than with the previous layouts. Considering the location of the wind turbines and the potential noise impact, it is my opinion that the change will not increase the significance of the noise impact. A full noise impact assessment with new modelling will not be required and the recommendations as contained in the previous document will still be valid

From an ecological perspective examination of the revised layout revealed that there are no turbines in no-go areas or high sensitivity areas considered unsuitable for turbine placement. Apart from the large reduction in the extent of the road network, which is seen as a positive step, there are also no roads which traverse no-go areas. While there are some roads which traverse minor drainage systems, such crossings have been reduced as far as possible and the remaining crossings are not avoidable and are considered acceptable. As such, the revised layout is considered well-mitigated and will significantly reduce the impact of the development on the terrestrial environment compared to the original project layouts. The assessed impacts as assessed in the original study were reviewed based on the revised layouts and changes in baseline information for the study area. The review indicated that the only impact that warranted change was the cumulative impact of the Umsinde Emoyeni project on CBAs and broad-scale ecological process, which was adjusted from the previous assessed impact of HIGH to the revised impact of LOW. This change is warranted as a result of both the change in the layout of the two projects which has significantly reduced impact compared to the original projects and also the change in the CBA status of large parts of the site based on the latest CBA mapping for the Northern and Western Cape. Apart from the cumulative impacts on CBAs, cumulative impacts overall can be considered to be LOW as the affected vegetation type is very extensive and local-level cumulative impacts are still low and the more sensitive parts of the wider landscape are not within the development area.

The proposed layouts for the facility would seem to have limited impact on the aquatic environment as many of the proposed structures will avoid the delineated watercourses. Based on the condition of some of the present crossings, the project thus presents an opportunity to improve the flow and erosion protection were existing culverts / crossings do exist.

No aquatic protected or species of special concern (flora) were observed during the site visit, as well as any natural wetlands. Therefore, based on the site visit the significance of the impacts assessed for the aquatic systems after mitigation would be LOW. This is based on the assumption that the projects will have a limited impact on the aquatic environment and with monitoring of flows, erosion and sedimentation, although unlikely, downstream fish populations will not be impacted upon. This is also coupled to the fact that all of the project components have avoided the alluvial systems.

There are seven potentially affected water courses crossing points that would trigger the need for a Water Use License application (a potential GA) in terms of Section 21 c and i of the National Water Act, should any construction take place within these areas. However, during the micro-siting process the four crossings could be reduced by moving some of the roads just outside of the buffer, i.e. these are not actual river crossing, and the proposed the road is only within the buffer. This would also apply to the transmission line, once the positions of the towers are known

An additional 12 months of bird monitoring was conducted on site. Numerous Red Data species, endemic or near-endemic species and priority species were again recorded on the Umsinde Emoyeni WEF site in 2016/17. Generally, activity of these and other target species was found to be similar to the initial monitoring programme (Pearson, 2015). However, a slight increase in flight activity (per hour of VP survey effort) was noted for Verreaux's Eagle, while an increase in Blue Crane records and abundance was observed on the WEF site, which may be partly attributable to an increase in survey effort in certain locations favoured by this species. While no additional Verreaux's Eagle nests were located in 2016/17, activity of this species remained high on the WEF site. Some species of potential concern, e.g. Amur Falcon, Lesser Kestrel, Steppe Buzzard, Booted Eagle, Secretarybird and Black Harrier, were not recorded (or were recorded in lower than expected numbers/activity) during the additional monitoring.

The results of 12 months of avifaunal monitoring were combined with the results of the initial monitoring and used to produce an updated and combined Flight Sensitivity Map and to identify no-go areas. It was recommended that turbines and overhead power lines are not placed within the "No-go for turbine and overhead powerline placement". No turbines should be constructed in all Avifaunal No-go Buffers. The current proposed layout adheres to this recommendation (see Figure 9.10).

These areas informed the placement of turbines in the revised turbine layout, with all turbines in the revised layout being placed outside of high or medium-high flight sensitivity areas. It was recommended that the hierarchy of sensitivity scores presented in the Flight Sensitivity Map be considered, with preferential turbine placement in areas with Low Sensitivity areas, followed by Medium Sensitivity areas. This, to a large degree has been adhered to in the revised layout, with most turbines located in low flight sensitivity zones, some in medium zones, and none in medium-high or high sensitivity zones.

After consideration of the additional monitoring findings, and recent data regarding mortality of species at operational WEFs in South Africa, it was the specialists opinion that the initially proposed 196 turbines (across both phases combined) would cause (if all turbines are built) an unacceptably high impact to the regions avifauna, particularly on a cumulative level. The number of turbines has significantly reduced from 196 to 70 turbines, across two phases, this from an avifauna perspective, is an acceptable number of turbines across the two phases of Umsinde.

If unsustainable levels of mortality to key threatened species are realised (as agreed between the specialist in consultations with DEA, BLSA and the BARESG group), mitigations including turbine shutdown, and even possible turbine relocation may need to be considered (and enforced by the DEA where required).

It is noted here that as technology improves, the use of fewer, more powerful machines is possible, potentially resulting in a smaller development footprint and a lower probability of collision impacts for birds. Therefore it is unlikely that 70 turbines will be constructed, as the proposed project is 'up to 35 turbines per phase' and it is more likely that a lower number would be constructed.

All applicable mitigation measures and recommendations (where they are not in contradiction to, or superseded by those given in this report) in the avifaunal impact assessment report (Pearson, 2015) must be adhered to.

Several turbines that were originally situated in high bat sensitive areas have been moved to Low-Medium and Medium areas. No turbines, nor their full rotor swept zone are in or within 75 m of a High or Medium-High bat sensitive area. IWS does not object to the 70 turbine project proceeding assuming all the recommendations in the report are met. The specialist also noted that in the context of cumulative impacts it would be important to assume a staggered approach to the environmental authorisations in a region, so learning can adequately inform future approvals. Perrold and MacEwan (2017) collated bat fatality data from across Year 1 studies at 10 operational WEFs from the Eastern, Northern and Western Cape Provinces of South Africa. For just that one year and only for a sub-set of the facilities, well over 1000 bats had been killed and this number continues to increase. The greater the number of turbines, the greater the potential for cumulative impact. Hence, keeping the number of turbines or the rotor swept zone as low as possible in order to meet the power requirements would be beneficial to bat populations. All mitigation measures in IWS (2015) and those specific measures superseded by IWS (2018) should be adhered to. The environmental authorisation (EA) to please also include all essential and best practise mitigation measures listed in this current report (IWS 2018) and those not amended from IWS (2015).

Cultural landscapes are highly sensitive to accumulative impacts and large scale development activities that change the character and public memory of a place. In terms of the National Heritage Resources Act, a cultural landscape may also include a natural landscape of high rarity value, aesthetic and scientific significance. The construction of a large facility can result in changes to the overall sense of place of a locality, if not a region. There will be high visibility of some turbines for a distance along local roads. A tangible change to sense of place will be experienced by farmer and road user however the impact will be reduced due to the lower number of turbines proposed. Major visual impacts to the R63 are avoided.

The findings of the Social Impact Assessment (SIA) (Barbour December 2015) indicated that the development of the proposed Umsinde Emoyeni W EF (Phase 1 and 2) would create employment and business opportunities for the local economy, specifically during the construction phase. However, for the community of Murraysburg and other local towns in the area to benefit from these opportunities will require the implementation of an effective training and skills development programme prior to the commencement of the construction phase and a commitment from the proponent to achieve local employment targets for low and semi-skilled jobs. The establishment of a Community Trust would also benefit the local community. The proposed development also represented an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole.

The SIA also noted that the potential visual impacts associated with the proposed Umsinde Emoyeni WEF could be effectively addressed by ensuring that no wind turbines are visible from the Farm Badsfontein. The Phase 2 development, will be marginally visible from Badsfontein Farm (gate, opstal and dam).

The recommendations contained in the VIA should be implemented.

Based on these findings the Social Impact Assessment (SIA) recommended that the Umsinde Emoyeni WEF (Phase 1 and 2) be supported, subject to the implementation of the recommended mitigation measures and management actions contained in the SIA and VIA Report.

The Revised Layout for Phase 2 will result in the total number of wind turbines being reduced from 98 Phase (original proposal) to 35. The total number of wind turbines associated with Phase 1 and 2 will therefore be 70 as opposed to 196. This represents a significant reduction. While the reduction in wind turbines will reduce the number of employment opportunities associated with the construction and operational phase, it will also reduce the visual and cumulative impacts of the proposed Umsinde WEF on the areas sense of place. This is regarded as an overall improvement.

The recommendations contained in the December 2015 SIA (Barbour, December 2015) remain valid, namely that the establishment of the Umsinde Emoyeni WEF (Revised Layout 2) be supported, subject to the implementation of the recommended mitigation measures and management actions contained in the SIA (December 2015) and VIA Report.

It was therefore recommended that the Umsinde WEF (Phase 2) be supported, subject to the implementation of the recommended mitigation measures and management actions contained in the SIA and VIA Report and the EMPR.

It is difficult to mitigate the visual effect of a wind energy facility of this size, except by eliminating or relocating some of the turbines, which to a large extent has been done, with the reduction in the number of turbines from 98 to 35.

The visual impact significance of Phase 2 would be high in intensity because of the location of the wind turbines, and because the proposed WEF would be visible from a range of viewpoints as can be seen in the photomontages. The significance has been reduced from high to medium through similar mitigations to those in Phase 1, including the elimination of many of the previously proposed turbines and through micro-siting.

Associated infrastructure, such as access roads, substation and maintenance buildings could also be mitigated and would have a similar medium significance rating.

The construction phase of the WEF and associated infrastructure would be short-term (<2 years) and would potentially have a low visual significance rating.

There are now significantly fewer turbines (35) than in the previous WEF proposal of 2015, the turbines have been moved further north, away from the Trouberg and sensitive receptors, distances from sensitive receptors have increased in many cases, and the viewshed is slightly less extensive, particularly towards the south. In addition, the fewer turbines would potentially result in slightly less visual clutter on the skyline, as well as fewer access roads and assembly platforms being required.

Therefore, the current layout is preferred for the reasons given above. It follows that the cumulative visual impact would also be slightly less for the current WEF proposals than for the previous 2015 proposals. Any approvals should be subject to the recommended visual mitigations.

The visual impact and the significance thereof associated with a 140 MW WEF on the areas sense of place is likely to vary from individual to individual.

Although this landscape has been assigned a high grade in terms of its quality, the proponent has gone to some lengths to design phase 1 to involve the most inhospitable and remote parts of the project area which means that much of the high scenic amenity value areas will be conserved albeit that elements of the proposed facilities will be visible, in the current layout there are only two potential visual receptors. Farms situated on the valley floors will probably not be seriously impacted to changes in sense of place, although the overall natural qualities of the project areas and aesthetic qualities will be impacted.

The remoteness of areas selected for especially phase 1 and the reduced number of turbines of Umsinde Emoyeni has mitigated this impact.

Assessment of Alternatives

Different alternatives ranging from site location, transportation, design, turbine technologies, and the No Development alternative have all been considered for the proposed WEF. When considering the alternatives the applicant needs to consider environmental, social and economic factors and technical factors. Considering the above mentioned factors, the applicant intends to use the best available technology to satisfy these factors.

The preferred site was chosen based on the following: because the site is located within an area that has a good wind resource, the four components of the proposed development have been located in the sections of the site that are of low-medium areas of ecological sensitivity. The No Development alternative was identified as having a high negative social cost to South Africa: firstly in terms of the country meeting its energy needs with clean, renewable energy and secondly a medium negative social cost in terms of lost employment and business opportunities and the benefits associated with the establishment of a Community Trust.

The No Development scenario is that the Umsinde Emoyeni WEF: Phase 2 cannot be constructed. This result will include the following:

- The land-use remains agricultural with no further benefits derived from the implementation of a complementary land use;
- There is no change in the current landscape or environmental baseline;
- Whilst no WEF development will occur on site, other wind energy projects go ahead as planned in the surrounding area;
- No additional electricity will be generated onsite or supplied through means of renewable energy resources. This would have implications for the South African Government in achieving its proposed renewable energy target;
- There is no opportunity for additional employment (albeit temporary) in the local area where job creation is identified as a key priority; and
- The local Economic Development benefits associated with the WEF development's REIPPPP commitments will not be realised.

The No Development alternative was not considered feasible in the context of the proposed development and the needed power that will be generated from this renewable resource.

Summary of Comments to date:

- Perceived exclusion of landowner occupiers from involvement in the EIA process;
- Objection to the content and the acceptance of the scoping land value report;
- Concern about the perceived manipulation of the EIA process by the EAP;

- Current struggles with power supply from Eskom;
- Request to be registered;
- Information requests and availability of the Draft EIA Report;
- Concern about the proximity of the proposed Ishwati Emoyeni WEF to the Umsinde Emoyeni WEF and cumulative impacts, particularly on bird species;
- Concerns about the adequacy of the avifauna specialist report;
- Request for extension of Draft EIA Report comment period;
- Request for clarity on the proposed Community Trust and development shareholding;
- Safety and security concerns during the construction phase of the project;
- Request for details on business opportunities during the operational phase of the project;
- Request for clarification of the impact assessment ratings (Methodology);
- Enquiry on whether additional public meeting/s will take place in Richmond or another venue;
- Enquiry on employment opportunities during the operational phase of the project;
- Concern about loss of current jobs due to the proposed Umsinde Emoyeni WEF;
- Concern regarding the negative impacts of the proposed project on current businesses (eco-tourism, local farming practices, game hunting, and other local businesses);
- Requests for examples of business opportunities that can arise from the proposed development and from operational wind farms.
- Enquiry regarding a specialist study on bees;
- Enquiry on the determination of a project approval;
- Concerns regarding the impact of the proposed development on the land prices/ value of affected and surrounding farms;
- Request for exclusion of very high sensitive areas from the development footprint;
- Inclusion of Beaufort West and Richmond towns to positive economic development of the WEF as they have their own WEFs;
- Clarification on whether or not heritage resources are to be impacted by the proposed turbine positions or access roads;
- Enquiry if the EIA process determines whether or not the development will go ahead or if it is people's views, it seems like it is mostly the farmers and land owners that have issues with the proposed development.
- Concerns about presence of important birds species and habitat within the development study;
- Concern about social impacts on the town due to influx of workers;
- Concerns about negative visual impacts, ecological impacts and Sense of place;
- Concerns about dust and air pollution;
- Concern about noise impact;
- Concern about the impact of the proposed development and existing infrastructure;
- Clarification on who comprises "project team";
- Avoidance of dusty areas from construction may affect the grazing rotation systems;
- Short term benefits versus long term impacts of the proposed project and
- Alternative renewable energy projects.

Summary of the Impact Assessment

Potential environmental impacts were evaluated according to their extent, duration, intensity and magnitude. Negative impacts of the proposed project on the biophysical environment include clearing of vegetation that leads to habitat fragmentation, potential loss of species of concern, soil erosion, surface water pollution; while social-economic impacts being minimal loss of agricultural land, disruption of social relations within the proposed area by the introduction of contractor workers from different areas, spread of diseases, loss of potential heritage resources and impact on sense of place.

All impacts have been identified and assessed at different stages (design/planning, construction, operation and decommission) and possible mitigation measures assigned to ensure low significance (for negative impacts) or high significance (for positive impacts) as outlined in the Environmental Management Programme (Appendix B). These impacts have been summarised in the tables below for construction phase and operational phase.

Summary of Construction Phase Impacts

Construction Phase	Consequence	Probability	Significance	Status	Confidence
Geology, Soils and Agricultural Potential Impact					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Impact 1: Turbine footprint construction	Low	Definite	Low	- ve	High
With Mitigation	Low	Definite	LOW	- ve	High
Impact 2: Construction of buildings and infrastructure	Low	Definite	Low	- ve	High
With Mitigation	Low	Definite	LOW	- ve	High
Impact 3: Construction of roads	Low	Definite	Low	- ve	High
With Mitigation	Low	Definite	LOW	- ve	High
Impact 4: Vehicle operation and spillages	Very Low	Definite	Low	- ve	High
With Mitigation	Very Low	Improbable	Insignificant	- ve	High
Impact 5: Dust generation	Low	Definite	Low	- ve	High
With Mitigation	Very Low	Improbable	Insignificant	- ve	High
Terrestrial Ecological Impacts					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Impacts on vegetation and listed or protected plant species resulting from construction activities	High	Probable	High	Negative	High
After Mitigation:	Medium	Probable	Medium	Negative	High
Alien Plant Invasion Risk	Medium	Probable	Medium	Negative	High
After Mitigation:	Very Low	Probable	Low	Negative	High
Increased Erosion Risk	Medium	Probable	Medium	Negative	High
After Mitigation:	Very Low	Probable	Very Low	Negative	High
Direct faunal impacts during construction	Medium	Probable	Medium	Negative	High
After Mitigation:	Low	Probable	Low	Negative	High
Bats					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Impact 1: Roost disturbance and/or destruction due to wind turbine, O&M building and sub-station construction	Medium	Probable	Medium	Negative	High
With Mitigation:	Very Low	Possible	Insignificant	Negative	High

Construction Phase	Consequence	Probability	Significance	Status	Confidence
Impact 2: Disturbance to and displacement from foraging habitat due to wind turbine, O&M building and sub-station construction	Medium	Definite	Medium	Negative	High
With Mitigation:	Low	Definite	Low	Negative	High
Birds					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Habitat Destruction	Medium	Definite	Medium	Negative	High
With Mitigation:	Low	Definite	Low	Negative	High
Disturbance and Displacement	Low	Definite	Low	Negative	High
With Mitigation:	Very low	Definite	Very low	Negative	High
Heritage					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Palaeontology	Medium-high	Probable	Med - High	Negative	Medium
With Mitigation:	Medium	Probable	Medium	Positive and Negative	Medium
Pre-colonial heritage	Medium	Probable	Medium	Negative	High
With Mitigation:	Low	Improbable	V low	Neutral	High
Landscape/setting	Medium	Likely	Medium	Negative	High
With Mitigation:	Medium	Likely	Medium	Negative	High
Impact Assessments that changed after updated 35 Turbine Layout					
Colonial heritage at 98 Turbine Layout	Medium	*Probable*	Medium	Negative	High
With Mitigation at 98 Turbine Layout:	Medium	Probable	Medium	Positive	High
Colonial heritage	Medium	Possible	Medium	Negative	High
With Mitigation:	Medium	Probable	Medium	Positive	High
Palaeontological Heritage Impact					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Disturbance, damage or destruction of well-preserved fossils at or beneath the ground surface during the construction phase (especially due to bedrock excavations, ground clearance)	High	Possible	Medium	Negative	Medium
With Mitigation	Medium	Possible	Low	Positive and Negative	Medium
Noise					

Construction Phase	Consequence	Probability	Significance	Status	Confidence
Impact Assessments that remained the same after updated 35 Turbine Layout					
Construction Noise	Low	Improbable	Very Low	Negative	High
Visual					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Construction of Turbines	Low	Probable	Low	Negative	Medium
With Mitigation:	Low	Probable	Low	Negative	Medium
Wetlands and freshwater					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Loss of riparian systems and water course		High	Medium	Negative	High
With Mitigation:		High	Low	Negative	High
Impact on riparian systems through the possible increase in surface water runoff from hard surfaces and or roads on riparian form and function		High	Medium	Negative	High
With Mitigation:		High	Low	Negative	High
Increase in sedimentation and erosion within the development footprint		High	Medium	Negative	High
With Mitigation:		High	Low	Negative	High
Impact on localized surface water quality		High	Medium	Negative	High
With Mitigation:		High	Low	Negative	High
Social Impacts					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Benefits associated with providing technical advice to local farmers and municipalities	Low	Probable	N/A	Negative	High
With Mitigation/Enhancement:	Low	Probable	Low (Positive)	Positive	High
Improved cell-phone coverage	Low	Probable	Low (Positive)	Positive	High
With Mitigation/Enhancement:	Low	Probable	Low (Positive)	Positive	High
Presence of construction workers and potential impacts on family structures and social networks	Medium	Probable	Medium (Negative for community as a whole)	Negative	High
With Mitigation/Enhancement:	Low	Probable	Low (Negative for a community as a whole)	Negative	High
Influx of job seekers	Low	Probable	Low (Negative)	Negative	Medium

Construction Phase	Consequence	Probability	Significance	Status	Confidence
With Mitigation/Enhancement:	Low	Probable	Low (Negative)	Negative	Medium
Safety risk, stock theft and damage to farm infrastructure associated with presence of construction workers	Low	Definite	Low (Negative)	Negative	High
With Mitigation/Enhancement:	Very low	Definite	Very low (Negative)	Negative	High
Increased risk of veld fires	Medium	Probable	Medium (Negative)	Negative	High
With Mitigation/Enhancement:	Low	Probable	Low (Negative)	Negative	High
Impact of heavy vehicles and construction activities	Medium	Definite	Medium (Negative)	Negative	High
With Mitigation/Enhancement:	Low	Definite	Low (Negative)	Negative	High
Loss of farmland	Low	Definite	Low (Negative)	Negative	High
With Mitigation/Enhancement:	Very low	Definite	Very Low (Negative)	Negative	High
Impact Assessments that changed after updated 35 Turbine Layout					
Creation of employment and business opportunities at 98 Turbine Layout	Low	Probable	Low (Positive)	Positive	High
With Mitigation/Enhancement at 98 Turbine Layout:	High	Probable	*High (Positive)*	Positive	High
Creation of employment and business opportunities	Low	Probable	Low (Positive)	Positive	High
With Mitigation/Enhancement:	High	Probable	Medium (Positive)	Positive	High

Summary of Operation Phase Impacts

Operational Phase	Consequence	Probability	Significance	Status	Confidence
Terrestrial Ecological Impacts					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Alien plant invasion risk	Medium	Definite	Medium	Negative	High
After Mitigation:	Low	Probable	Low	Negative	High
Increased erosion risk	Medium	Definite	Medium	Negative	High
After Mitigation:	Low	Probable	Low	Negative	High
Faunal impacts during operation	Medium	Probable	Medium	Negative	High
After Mitigation:	Medium	Probable	Medium	Negative	High
Bats					
Impact Assessments that remained the same after updated 35 Turbine Layout					

Fragmentation of foraging habitat or migration routes due to the presence of the operating wind turbines and general WEF activity	High	Probably	HIGH	Negative	High
With Mitigation	Low	Probably	LOW	Negative	High
Fatalities of Medium-High and High risk bat species due to collision or barotrauma during foraging activity, attraction to turbines and during seasonal movements or migration events.	Very High	Probable	VERY HIGH	Negative	High
With Mitigation:	Medium	Possible	LOW	Negative	High
Birds					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Disturbance and Displacement	Medium	Probable	Medium	Negative	High
With Mitigation:	Low	Probable	Low	Negative	High
Power Line Collisions	High	Probable	High	Negative	High
With Mitigation:	High	Possible	Medium	Negative	High
Wind Turbine Collisions	Very High	Probable	Very high	Negative	Medium
With Mitigation:	High	Possible	Medium	Negative	Medium
Impact Assessments that changed after updated 35 Turbine Layout					
Electrocution at 98 Turbine Layout	High	Probable	*High*	Negative	High
With Mitigation at 98 Turbine Layout:	High	Improbable	*Medium*	Negative	High
Electrocution	High	Probable	Medium	Negative	High
With Mitigation:	High	Improbable	Low	Negative	High
Visual					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Wind Turbines	Very High	Definite	High	Negative	High
With Mitigation:	Medium	Probable	Medium	Negative	Medium
Powerlines / Infrastructure	Medium	Definite	Medium	Negative	High
With Mitigation:	Low	Probable	Low	Negative	Medium
Noise					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Operational Noise	Low	Possible	Low	Negative	High
Social					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Establishment of Community Trust	Medium	Definite	Medium (Positive)	Positive	High
With Mitigation:	High	Definite	High (Positive)	Positive	High

Promotion of renewable energy projects	Medium	Definite	Medium (Positive)	Negative	High
With Mitigation:	Medium	Definite	Medium (Positive)	Positive	High
Visual impact and impact on sense of place	High	Definite	High (Negative)	Negative	High
With Mitigation:	Medium	Definite	Medium (Negative)	Negative	High
Impact on tourism	Medium	Definite	Medium	Negative	High
With Mitigation:	Low	Definite	Low	Negative	High
Impact Assessments that changed after updated 35 Turbine Layout					
Creation of employment and business opportunities at 98 Turbine Layout	Low	Definite	Low (Positive)	Positive	High
With Mitigation at 98 Turbine Layout:	Medium	Definite	*Medium (Positive)*	Positive	High
Creation of employment and business opportunities	Low	Definite	Low (Positive)	Positive	High
With Mitigation:	Medium	Definite	Low (Positive)	Positive	High

Summary of Findings

From the assessment, it is evident that the construction and the operation of the WEF and grid connections will have negative impacts both socially and environmentally but when appropriate mitigation measures applied negative impacts are outweighed by positive impacts. Overall the project has a positive economic impact regionally and for South Africa through the generation of clean power, the creation of job opportunities in a extremely rural and economically depressed area, and contribute to the local and regional economy. All identified negative impacts can be successfully mitigated and there are no impacts with an assigned significance rating of "High" after mitigation has been implemented.

Throughout the process for Umsinde Emoyeni WEF sensitive areas and constraints within the WEF site boundary were identified by the specialists. This included results from 24 month bird and 12 month bat monitoring programmes. Constraints maps were delivered to the applicant and these were taken into consideration in the development of the proposed turbine layout and grid connections. Therefore the proposed location of Phase One within the WEF site boundary takes into consideration these identified constraints and is outside of highly sensitive areas. The applicant has optimised the development layout and produced a layout, which takes into consideration, all environmental and social factors, including potential cumulative impacts. Through this process, the layout has evolved from 98 turbines to 55 turbines to the now proposed 35 turbines. Based on this assessment and the finding of the updated specialist's assessments, it is the opinion of the Environmental Assessment Practitioner (EAP) that the majority of negative impacts associated with the implementation of the proposed project have been mitigated to acceptable levels and the extent of the benefits associated with the implementation of the projects will benefit a much larger group of people, in terms of a positive local and regional economic impact, job creation, community upliftment and by definition the generation of power for the country.

Careful consideration must be given for the operational monitoring of birds and bats at the WEF site. The results of which must be shared with SABAAP and EWT and BirdLife SA. Should unsustainable mortalities of birds and bats occur during the operational phase, recommendations from the bird and bat specialists must be adhered to.

Public Review of Revised Final EIA Report

This Revised Final EIA Report has been made available at the following locations for public viewing. The commenting period is from 09 February 2018 to 10 March 2018 (both days inclusive).

Public Placement Venue	Address
Ubuntu Local Municipality	78 Church Street, Victoria West
Beaufort West Local Municipality	112 Donkin Street, Beaufort West
Richmond Ntsikelelo Tida Library	Bernie Groenewalt Street, Richmond
Richmond Police Station	Brink Street, Richmond
Beaufort West Local Municipality (Murraysburg Office)	23 Beaufort Street, Murraysburg
Murraysburg Farmers' Co-operative	36 Leeb Street, Murraysburg
Murraysburg Library	17 Beaufort Street Murraysburg 6995
Website	www.arcusconsulting.co.za

It should be noted that as this is a Revised Final EIA report, comments on the report must be sent directly to the DEA, with the EAP copied in.

Volume II of this EIA report contains the public participation undertaken for this proposed development. Volume II contains the Issues and Responses Report, which expands on the comments received during the EIA phase, as well as the project team responses for each comment received. It is the opinion of the EAP that all issues and concern received throughout the EIA process (scoping phase and EIA phase) have been adequately addressed in this report, and adequately responded to in this Issues and Response Report.

Key changes from the Final EIA Report to this Revised Final EIA Report:

- Comments received after submission of the Final EIA Report (April 2016) have been included in the Public Participation Report (Volume II);
- Changes have been made in the following sections (these include updating the project description and the specialists studies):
  - Executive Summary
  - Executive Summary: Summary of Construction Phase Impacts Table: Social impacts
  - Executive Summary: Summary of Operational Phase Impacts Table: Social impacts
  - Section 1 Introduction
  - Section 1.8 DEA Letter of Rejection
  - Section 4 The Proposed Development
  - Section 6 Alternative Assessment
  - Section 11 Updated Specialist Studies Assessment on 35 Turbine Layout
  - Section 12 Updated Cumulative Impact Assessment on Revised Turbine Layout
  - Section 13.1 Additional Public Participation
  - Section 14 Summary of Findings and Conclusion
  - Section 15 Impact Statement

Next step in the EIA process

Should you have any comments on the Revised Final EIA Reports, please submit comments directly to the DEA (information provided below), and copy in the EAP. All comments received will be collated and submitted to the DEA at the end of the 30 day comment period as part of a revised EIA report.

Following submission of the Revised Final EIA Reports, the DEA will either accept or reject the reports. Once the Final EIA Reports have been accepted by the DEA, the DEA will make a decision on the four applications.

All comments on the Revised Final EIA Reports should be submitted to Mr Herman Alberts, HAlberts@environment.gov.za at the Department of Environmental Affairs, Private Bag X 447, Pretoria 0001, citing the relevant DEA reference numbers stated above, with a copy to Nobuhle Hughes, emoyeni@eims.co.za at Environmental Impact Management Services (Pty) Ltd (EIMS), P.O. Box 2083, Pinegowrie, 2123, no later than 08 March 2018.

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EAP STATEMENT OF INDEPENDENCE

This Revised Final Environmental Impact Assessment Report has been commissioned by Windlab Developments South Africa (Pty) Ltd on behalf of Emoyeni Wind Farm Project Proprietary Limited (EWFP) to undertake a combined environmental impact assessment in terms of the 2010 EIA Regulations R.543, R.544, R.545 and R.546 under the National Environmental Management Act, 1998 (Act No. 107 of 1998, with amendments) ('the Regulations').

In compiling this report, the authors comply with the general requirements for Environmental Assessment Practitioners (EAPs) as set out below in the Regulations:

"*General requirements for EAPs or a person compiling a specialist report or undertaking a specialised process:*

17. An EAP appointed in terms of regulation 16(1) must—

(a) Be independent;

(b) Have expertise in conducting environmental impact assessments, including knowledge of the

Act, these Regulations and any guidelines that have relevance to the proposed activity;

(c) Perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;

(d) Comply with the Act, these Regulations and all other applicable legislation;

(e) take into account, to the extent possible, the matters referred to in Regulation 8 when preparing the application and any report relating to the application; and

(f) Disclose to the applicant and the competent authority all material information in the possession of the EAP that reasonably has or may have the potential of influencing—

(i) Any decision to be taken with respect to the application by the competent authority in terms of these Regulations; or

(ii) The objectivity of any report, plan or document to be prepared by the EAP in terms of these Regulations for submission to the competent authority."

Ashlin Bodasing

ABBREVIATIONS AND ACRONYMS

AGIS	Agricultural Geographic Information System
BGIS	Biodiversity Geographic Information System
BEE	Black Economic Empowerment
BID	Background Information Document
BWLM	Beaufort West Local Municipality
CITES	Convention on the Trade in International Endangered Species
CKDM	Central Karoo District Municipality
DAFF	Department of Agriculture, Forestry and Fisheries
dB	Decibel
DEA	National Department of Environmental Affairs
DEADP	Department of Environmental Affairs and Development Planning (Western Cape)
DEIAR	Draft Environmental Impact Assessment Report
DEM	Digital Elevation Model
DENC	Department of Environment and Nature Conservation (Northern Cape)
DoE	Department Of Energy
DWA	National Department of Water Affairs
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ESA	Ecological Support Area
Eskom	Eskom Holdings SOC Limited
EWFP	Emoyeni Wind Farm Project Proprietary Limited
FEIAR	Final Environmental Impact Assessment Report
FEPA	Freshwater Ecosystem Priority Area
GIS	Geographical Information Systems
GNR	Government Notice Regulation
GWh	Gigawatt hour
HDI	Historically Disadvantages Individuals
HWC	Heritage Western Cape
HV	High Voltage
Hz	Hertz
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IPP	Independent Power Producer
IRP	Integrated Resource Plan
IUCN	International Union for the Conservation of Nature

km	Kilometre
kV	Kilovolt
kWh	Kilowatt Hours
LUPO	Land Use Planning Ordinance (Ordinance 15 of 1985)
m	Metre
mm	Millimetre
MW	Megawatt
NEMA	National Environmental Management Act (Act 107 of 1998)
NFEPA	National Freshwater Ecosystem Priority Area
NHRA	National Heritage Resources Act (Act 25 of 1999)
NSD	Noise Sensitive Development
PES	Present Ecological State
PPA	Power Purchasing Agreement
PICC	Presidential Infrastructure Coordinating Committee
PPP	Public Participation Programme
PSEIA	Plan of Study for EIA
QDS	Quarter Degree Squares
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
RSH	Rotor Swept Height
SABAAP	South African Bat Assessment Advisory Panel
SABIF	South African Biodiversity Information Facility
SAGC	South African grid code
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited
SDF	Spatial Development Framework
SIA	Social Impact Assessment
SIPS	Strategic Integrated Projects
SPV	Special Project Vehicle
TWI	Total Wetness Index
WDSA	Windlab Developments South Africa (Pty) Ltd
WULA	Water Use License Application

REVISED FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT

FOR

THE UMSINDE EMOYENI WIND ENERGY FACILITY PHASE 2 WESTERN CAPE

Table A DEA Technical Details Requirements

Component	Description
Number of Turbines	Maximum 35
Hub height	135 m
Blade length	75 m
Rotor diameter	150 m
Area occupied by inverter/transformer stations/substations	200 x 250 m substation compound Single storey
Capacity of onsite substation	33/132 kV
Area occupied by both permanent and construction laydown areas	150 m x 60 m
Areas occupied by buildings	200 m x 250 m
Length of internal roads	
Width of internal roads	9 m during construction, 4-6 m during operation
Proximity to grid connection	63 km (from WEF Phase 1 Substation to Gamma Substation)
Height of fencing	2 m - 2.5 m
Type of fencing	Steel palisade fencing around construction camp Concrete palisade around substation

1 INTRODUCTION

1.1 Background

Emoyeni Wind Farm Project Proprietary Limited (EWFP) are proposing the development of the Umsinde Emoyeni Wind Energy Facility (WEF), and associated infrastructure including grid connection infrastructure (the proposed development), located near the town of Murraysburg in the Western Cape. A small portion of the proposed development site (which comprises the WEF Site and the Grid Site: Figure 1.1) transcends into the Northern Cape Province.

There are four components to the proposed development, representing two development phases:

- Umsinde Emoyeni WEF: Phase 1 ;
- Electrical Grid Connection and Associated Infrastructure for Umsinde Emoyeni WEF Phase 1;
- Umsinde Emoyeni WEF: Phase 2 (the focus of this report); and
- Electrical Grid Connection and Associated Infrastructure for Umsinde Emoyeni WEF Phase 2.

The location of the proposed development site is shown on Figure 1.1 and the specific boundaries of the WEF site on Figure 1.2. It should be noted this site boundary includes the total area within which the proposed development was initially assessed. The footprint of the proposed development will only occupy a small portion of the land within this boundary (Figure 1.3).

Arcus Consultancy Services Ltd (Arcus) were appointed to undertake the environmental impact assessment (EIA) process, incorporating both the scoping and EIA phase, for the proposed development. The scoping process was undertaken through a combined process of all four phases mentioned above, as well as one combined scoping report.

The final scoping report was submitted to the DEA on 16 January 2015 for acceptance. On 30 April 2015 the DEA accepted the combined scoping report, with certain conditions and requirements for the EIA phase of the process.

One of the conditions of the DEAvon acceptance of the scoping report was that for the EIA phase of the project, each component will have its own impact assessment report and environmental management programme.

Each component is subject to a separate application for Environmental Authorisation to the DEA. The Final EIA Report for The Umsinde WEF Phase 2 was submitted to the DEA in April 2016 for environmental authorisation.

The public participation process is combined for all four components of the proposed development.

1.2 DEA Rejection of Final EIA Report

In September 2017 the DEA sent a letter of rejection of the final EIA Report for the proposed project – Phase 1 of the Umsinde Emoyeni Phase 1. The letter included a number of conditions that required compliance before the Department would be willing to accept the report, and commence with the review in order to make an informed decision on the application. Table 1.3 indicates the EAPs response to the Departments requirements as well as an indication of where in the report these requirements are addressed. A copy of the rejection letter can be found in Appendix C

This Revised Final EIA Report is made available to all registered Interest and Affected Parties for review and comment for a period of 30 days. Copies of the report are available at the following locations:

Public Placement Venue	Address
Ubuntu Local Municipality	78 Church Street, Victoria West
Beaufort West Local Municipality	112 Donkin Street, Beaufort West
Richmond Ntsikelelo Tida Library	Bernie Groenewalt Street, Richmond
Richmond Police Station	Brink Street, Richmond
Beaufort West Local Municipality (Murraysburg Office)	23 Beaufort Street, Murraysburg
Murraysburg Farmers' Co-operative	36 Leeb Street, Murraysburg
Murraysburg Library	17 Beaufort Street Murraysburg 6995

1.3 The Proposed Project – Umsinde Emoyeni Wind Energy Facility Phase 2

The proposed project WEF phase 2 will comprise no more than 35 wind turbines with a contracted capacity of 140 MW. Turbines with a maximum height to tip of blade of 210 m will be considered (hub height of 135 m, rotor diameter up to 150 m) (Figure 2.1). The proposed project will be located on the north east portion of the WEF site boundary (Figure 1.3).

In addition to the Umsinde Emoyeni WEF Phase 2, EWFP also proposes obtaining Environmental Authorisation from the Department of Environmental Affairs (DEA) for Eskom Transmission and Eskom Distribution Grid Connection Infrastructure for the required grid connection infrastructure. If an Environmental Authorisation for the grid connection infrastructure is granted, this may be entirely or partially transferred from EWFP to Eskom Holdings SOC Limited (Eskom). The grid connection infrastructure will be routed from an on-site substation within the boundary of WEF Phase 2 and ultimately connect to the existing national grid connection at the Eskom Gamma Substation.

1.4 Project Proponents

1.4.1 Emoyeni Wind Farm Project Proprietary Limited (EWFP)

EWFP is a Special Purpose Vehicle (SPV) established under Windlab Developments South Africa (Pty) Ltd (WDSA), which is a wholly-owned subsidiary of Windlab Systems (Pty) Ltd (Windlab).

Windlab is an international wind energy development company which was established in 2003 through the commercialisation of wind mapping technology developed by Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO). Making use of wind mapping technology and a suite of world-leading atmospheric modelling and wind energy prospecting tools such as WindScape™ and RaptorNL™, Windlab is able to successfully identify, secure and develop commercial wind farm sites.

Windlab has a growing project portfolio of over 6,500 MW in varying stages of development and implementation with projects in Canada, the United States of America, Australia, New Zealand and South Africa. In 2007 and 2008, Windlab established three subsidiary companies in the United States, Canada and South Africa respectively. WDSA, the South African subsidiary of Windlab is therefore responsible for developing wind energy projects in South Africa, in accordance with the Department of Energy's (DoE) Renewable Energy Independent Power Producers Procurement Program (REIPPPP). The REIPPPP is described further in Section 3.1 of this report.

WDSA has been involved with a number of wind energy developments in South Africa both independently as well as in partnerships with other wind energy developers. Examples include two wind energy projects which were awarded preferred bidder status in Round 2 of the REIPPPP. The first is the 91 MW West Coast One project near Vredenburg in the Western Cape, and the second is the 138 MW Amakhala Emoyeni Phase 1 project near Bedford in the Eastern Cape.

Through a Special Project Vehicle (SPV) Special Energy Project (Pty) Ltd, WDSA is also the proponent for the Ishwati Emoyeni WEF and associated grid infrastructure, the development boundary for which is adjacent to this Umsinde Emoyeni Proposed Development Site. The Ishwati Emoyeni WEF was approved by the DEA and is currently under appeal.

In accordance with the REIPPPP bid requirements, WDSA have established EWFP as a SPV to obtain the Environmental Authorisation and preferred bidder status for each of the proposed two phases of the Umsinde Emoyeni Wind Energy Facility.

1.5 The EIA Project Team

1.5.1 Details of the Environmental Assessment Practitioner (EAP)

The coordination and management of the EIA process is being conducted by Arcus with the lead EAP being Ashlin Bodasing.

Arcus is a specialist environmental consultancy providing environmental services to the renewable energy market. We have advised on over 150 renewable energy projects around the globe through both our EAP and in-house specialist services. Our team consists of specialists in the field of:

- Ecology;
- Avifauna;
- Bats;
- Cultural heritage;
- Noise;
- Hydrology and hydrogeology; and
- GIS.

Ashlin is an environmental consultant, having obtained her Bachelor of Social Science Degree from the University of Kwa-Zulu Natal; she has over 10 years' experience in the environmental consulting industry in southern Africa. She has gained extensive experience in the field of Integrated Environmental Management, environmental impact assessments and public participation. She has also been actively involved in a number of industrial and infrastructural projects, including electricity power lines and substations; road and water infrastructure upgrades and the installation of telecommunication equipment, green field coal mines, as well as renewable energy facilities, both wind and solar. Ashlin has major project experience in the development of Environmental Impact Assessments, Environmental Management Plans and the monitoring of construction activities.

Ashlin's CV is included in Appendix A.

Ashlin is being assisted with the Public Participation Process of the proposed development EIA process by Environmental Impact Management Services (EIMS).

1.5.2 EIA Team

The EAP has assembled a team of technical specialists to undertake the scoping and EIA process; this includes identifying any negative and positive impacts, assigning a significance rating and identifying possible mitigation options. The specialist studies included in the EIA for the proposed development are listed in Table 1.1. These studies have been identified as relevant to the proposed development due to the nature of the proposed project.

These specialists have been selected based on their experience in the field of EIA and of renewable energy projects, and the locality of the proposed development.

Table 1.1 below prescribes the roles and responsibilities of parties involved in the EIA.

Table 1.1 EIA Project Team

<table>
<tr><th>Name</th><th>Organisation</th><th>Role</th></tr>
<tr><td>Ashlin Bodasing</td><td>Arcus Consulting</td><td>Project Manager</td></tr>
<tr><td>Liam Whitlow and Nobuhle Hughes</td><td>EIMS</td><td>Public Participation Coordination and Management of I&AP process.</td></tr>
<tr><td>Andrew Pearson and Mike Armitage</td><td>Arcus Consulting</td><td>Bird Impact Assessment and Monitoring</td></tr>
<tr><td>Kate McEwan</td><td>NSS Environmental</td><td>Bat Impact Assessment and Monitoring</td></tr>
<tr><td>Simon Todd</td><td>Simon Todd Consulting</td><td>Terrestrial Ecological Impact Assessment (Flora and Fauna)</td></tr>
<tr><td>Dr Tim Hart</td><td>ACO Associates</td><td>Heritage Impact Assessment</td></tr>
<tr><td>Dr Almond</td><td>via ACO Associates</td><td>Palaeontology Assessment</td></tr>
<tr><td>Dr Brian Colloty</td><td>Scherman Colloty and Associates</td><td>Aquatic/ Wetland Assessment</td></tr>
<tr><td>Mome de Jager</td><td>Enviro-Acoustic Research</td><td>Noise Impact Assessment</td></tr>
<tr><td>Bernard Oberholzer</td><td>Bernard Oberholzer Landscape Architects</td><td rowspan="2">Visual Assessment</td></tr>
<tr><td>Quinton Lawson</td><td>Meirelles Lawson Burger Architects</td></tr>
<tr><td>Dr JH van der Waals</td><td>Terrasoils</td><td>Soil and Agriculture</td></tr>
<tr><td>Tony Barbour</td><td>Tony Barbour Environmental Consulting and Research</td><td>Social Impact Assessment</td></tr>
</table>

1.6 Structure of this Report

This report is set out as follows:

Volume I –Revised Final EIA reports for the four components

- Chapter 1 – Introduction to the proposed development, the scoping and EIA process, the project proponents and the EIA project team;
- Chapter 2 – The legal environmental framework, including the EIA process, listed activities in the EIA regulations, assessment techniques, and consultation and public participation;
- Chapter 3 – Review of applicable plans and policies relating to renewable energy, including the REIPPPP;
- Chapter 4 – The proposed development of Umsinde Emoyeni WEF phase 1 and 2 and associated electrical grid connection phase 1 and 2;
- Chapter 5 – Need and desirability of the proposed development;

- Chapter 6 – The assessment of alternatives;
- Chapter 7 – The proposed project: Umsinde Emoyeni WEF Phase 1;
- Chapter 8 – Description of the baseline environment;
- Chapter 9 – Identification of impacts and mitigation measures;
- Chapter 10 - Cumulative impacts;
- Chapter 11- Updated Specialist Assessment on 35 Turbine Layout
- Chapter 12 – Updated Cumulative Assessment of 35 Turbine Layout
- Chapter 13 – Public Participation
- Chapter 14 - Summary of findings and recommendations; and
- Chapter 15 – Impact statement.

Appendix A – EAP CV and Declaration of Independence
Appendix B – Environmental Management Programme
Appendix C – Letter of Rejection from DEA and Minutes of Meeting
Appendix D – DEA Response to Andre van der Spuy

Volume II – Public Participation Process
Volume III – Specialist Studies

1.7 DEA SCOPING ACCEPTANCE REQUIREMENTS

In April 2015 the DEA accepted the final scoping report for the proposed project. Included in the acceptance letter was a list of requirements to be undertaken for the EIA phase. The table below (Table) includes all the requirements and the relevant sections in this report where these have been addressed.

Table 1.2 DEA Scoping Acceptance Requirements for EIA

DEA REQUEST	Applicable Section in DEIAR
All comments and recommendation made by all stakeholders and I&APs in the DSR and FSR must be taken into consideration for the EIAR	Volume II
Address and include all mitigation measures and recommendations from the specialists studies in the FEIAR and EMPr	Chapter 9, 10, 11, 12 Appendix B
Submit all comments from relevant stakeholders (WC and NC provincial environment departments, DAFF, SACAA, DoT, DWS, SENTECH, SANRAL, SAHRA, EWT, BIRDLIFE, SABAAP, DMR, SKA, etc.)	Volume II
Address all issues raised by organs of state and I&APs prior to submission of the EIAr	Volume II
Proof of correspondence with the various stakeholders must be included in the EIAr, including proof of attempts to obtain comments	Volume II
A3 Regional Map of the area and the site layout, to illustrate turbine positions and associated infrastructure. The map must include: Cardinal points; Co-ordinates; Legible legends; Indicate alternatives; Latest land cover; Vegetation types; and A3 size locality map	One regional map with all the requirements, was not legible on A3 format, therefore the following A3 maps where produced to take into consideration the specific requirements: Figure 1.1 – Site Location Figure 1.2 – WEF Site Boundary Figure 1.3 – WEF Turbine Layout and Potential Grid Connection Routes Figure 7.1 – Umsinde Emoyeni WEF Phase 1 Project Layout Figure 8.1 – Land Types Figure 8.2 – Vegetation Map
Applied listed activities and their relevant issues be addressed and assessed	Section 2.1 Table 2.1 Chapter 9, 10, 11, 12
Relevant listing notice activities applied for are specific and can be linked to the development activity or infrastructure as described in the project description.	Section 2.1 Chapter 7
Application form needs to be amended to specify the relevant activities	Will be submitted as part of the Revised final EIA Report
An amended application form with an indication of all the 2010 listed activities that are still listed;	Amended Application form will be submitted as part of the Revised final EIA Report
An indication of the similarly listed 2014 activities;	Section 2.1

An indication if there are any new 2014 activities listed; An indication where in the report all the 2014 activities have been assessed and mitigated for;	Table 2.1 Chapter 9,10, 11, 12
A letter/affidavit from the EAP indicating the above is true and correct	Appendix A
Provide an indication of the preferred and alternate locations from which the materials used for infilling will be sourced and where excavated material will be stored and disposed of. Impacts of this activity must be adequately assessed in the EIAr.	Appendix B (EMPr) Commercially sourced
Engage with relevant provincial authorities (Western Cape) for triggering GNR 546 • Activitiy 4: Construction of a road wider than 4 metres with a reserve less than 13,5 metres • Activity 10: The construction 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 m^3 • Activity 12: The clearance of an area of 300 m^2 or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation • Activity 14: The clearance of an area of 5 Ha or more of vegetation where 75% or more of the vegetative cover constitutes indigenous Vegetation • Activity 19: The widening of a road by more than 4 m, or the lengthening of a road by more than 1 km • Activity 24: not triggered	Activity 4: Volume II Activity 10: not triggered Activity 12: not triggered Activity 14: Appendix 1 Activity 19: Appendix 1 Activity 24: not triggered
Provide an assessment of the impacts and mitigation measures for each of the listed activities	Chapter 9, 10, 11, 12
Continuously involve relevant authorities, obtain their written comments and submit to DEA	Volume II
Provide technical details for the proposed facility in a table format as well as their description and/or dimensions. Minimum details:, area occupied by inverter / transformer stations / substations, capacity of on-site substation, area occupied by both permanent and construction laydown areas, area occupied by buildings, length of internal roads, width of internal roads, proximity to grid connection, height if fencing, type of fencing	Table 1.1
Provide four corner coordinates or each bend coordinate of the proposed development site as well as the start, middle and end point of all linear activities.	Figure 1.2 – WEF Site Boundary Figure 1.3 – WEF Turbine Layout and Grid Connections

Give clear indication of placing of turbines and all associated infrastructure mapped at an appropriate scale	Figure 1.3 - WEF Turbine Layout and Grid Connections Figure 7.1 – Umsinde WEF Phase 1 Project Layout
Clear description of all associated infrastructure including power lines, internal roads infrastructure and all supporting onsite infrastructure such as laydown area, guard house and control room etc	Chapter 7
Indicate location of the WEF in respect to the location of other energy facilities and their associated infrastructure	Figure 10.1
GNR544 Activities 11 and 18 may trigger Section 19 and Section 21 of the National Water Act No. 36 of 1998. Conduct a hydrological study whose terms of reference must include, inter alia the following: (a) Identification and sensitivity rating of all surface water courses for the impact phase of the proposed development; (b) identification, assessment of all potential impacts to the water courses and suggestion of mitigation measures; and (c) , recommendations on the preferred placement of turbines etc. and associated infrastructure	Chapter 9.3 Volume III
Provide motivation for the applicability of Item 10 of GNR 546 and assess the impacts	Item 10 of GNR 546 does not apply, as less than 30 m^3 of dangerous goods will be stored.
Provide detailed need and desirability as to why there is a need for the development and why the specific location is desirable.	Chapter 5
Submit the wind resource data as part of the EIAr. The data must be a summary of the wind resource available in the study area and motivate that the site has a good wind resource to sustain the Wind Energy Facility.	Chapter 5.1
Submit proof of application for a Water Use License should one be required	Should a water use licence be required this will be submitted prior to the start of construction. This has been accepted by the DEA. See Appendix II Public Participation.
Consult with the Department of Water and Sanitation during the course of the process and provide proof of consultation.	Volume II
SENTECH must be consulted to ensure that the WEF will not have any significant negative impact on the telecommunication signal in the area. Provide proof of consultation.	Volume II
Due to the proximity to SKA an EMI and RFI detailed studies must be undertaken and form part of the Draft EIAr. The EMI and RFI study must be sent to SKA for comment and their comments must be included in the EIAr and EMPr.	SKA TECHNICAL STUDY Volume III
Provide an indication of the internal access roads and the impacts associated with them must be adequately addressed in the EIAr and EMPr.	Chapter 9, 10, 11, 12

	Appendix B
Provide an indication of the preferred powerline route alternative and provide an assessment and advantages and disadvantages of the alternative powerline route.	Grid Connection Phase 1 and 2 EIA Reports (Voulume I)
Include all received comments and response thereto in comments and response report	Volume II
Information on who will supply services required on site, e.g. sewage, refuse removal, water and electricity. Obtain and include proof of agreements and confirmation of capacity.	Should the project be awarded preferred bidder, proof of these agreements will be submitted to the DEA. It is not anticipated that these services will be required to be provided for by the municipality.
Separate each facility and assess individually and separately in the EIAr.	Done: Final EIA Report for the Proposed Umsinde Emoyeni WEF Phase 1 (This Report) Final EIA Report for the Proposed Umsinde Emoyeni WEF Grid Connection Phase 1 Final EIA Report for the Proposed Umsinde Emoyeni WEF Phase 2 Final EIA report for the Proposed Umsinde Emoyeni WEF Grid Connection Phase 2
EIAr must be 4 separate documents with specialist studies specific to each site applied for. The specialist must provide recommendation and mitigation measures specific to each site. The EAP must provide mitigation measures; an assessment and recommendations for each site as well as the cumulative impacts of both facilities.	Done: Final EIA Report for the Proposed Umsinde Emoyeni WEF Phase 1 (This Report) Final EIA Report for the Proposed Umsinde Emoyeni WEF Grid Connection Phase 1 Final EIA Report for the Proposed Umsinde Emoyeni WEF Phase 2 Final EIA report for the Proposed Umsinde Emoyeni WEF Grid Connection Phase 2 Volume II - EMPr
The issues related specifically to each of the applications submitted, and the process followed according to the EIA regulations, 2010 must be indicated in the respective reports	Chapter 9, 10, 11, 12
The assessment of impacts and the Environmental Impact Assessment process; and the requirements of the Public Participation Process (PPP) must be in accordance with Regulation 54 to 57 of the GN R543 of EIA regulations 2010.	Section 2.6 Volume II
Include a copy of the final site layout map with all available biodiversity information. Existing infrastructure must be used as far as possible e.g. roads. Final layout map must include: 1. turbine positions and its associated infrastructure,	A3 maps were produced to take into consideration the specific requirements: Figure 1.1 – Site Location Figure 1.2 – WEF Site Boundary Figure 1.3 – WEF Turbine Layout and Potential Grid Connection Routes

2. permanent laydown footprint, 3. internal roads indicating width (construction period width and operation width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible) 4. wetlands, drainage lines, rivers, streams and water crossing of road and cables indicating the type of bridging structures that will be used 5. Location of sensitive environmental features e.g. CBAs, heritage sites, wetlands, drainage lines etc. that will be affected by the facility and its associated infrastructure 6. Substation(s) and/or transformer(s) sites including their entire footprint 7. Connection routes (including pylon positions) to the distribution/transmission network 8. All existing infrastructure on site, especially roads 9. Buffer areas 10. Buildings, including accommodation 11. All no-go areas	Figure 7.1 – Umsinde Emoyeni WEF Phase 1 Project Layout Figure 8.1 – Land Types Figure 8.2 – Vegetation Map
Provide an environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process	Figure 9.9
Provide a map combining the final layout map superimposed (overlain) on the environmental sensitivity map	Figure 9.10
Submit a shapefile of the preferred development layout/footprint	Yes

1.8 DEA Letter of Rejection Requirements

In September 2017, the DEA sent a letter of rejection of the final EIA, as submitted in April 2016. The letter included a list of requirements to be completed prior to resubmission of the Report to the department for authorisation. The table below indicated the DEA requirements as well as the relevant section of this report that it has been addressed. A copy of the letter is included in Appendix C, along with the minutes of the meeting held to discuss the letter. The letter states the following:

"The Environmental Impact Assessment Reports (EIArs} received on 20 April 2016 and receipt of the reports as acknowledged on 11 May 2016 for the abovementioned activity, submitted in terms of the requirement of the Environmental Impact Assessment (EIA} Regulations 2010, the letter dated 15 July 2017 indicating the concern expressed by Mr A van der Spuy and the correspondence dated 24 August 2017 informing Mr Van der Spuy of the outcome of the investigation, refer (Appendix D).

Following a review of the amended application form and the EIArs received on 20 April 2016, this Department rejects the EIArs in accordance with Regulation 34(1) (a) of the EIA Regulations, 2010.

In terms of Regulation 56(2) of the EIA Regulations, 2010 before the EAP managing an application for environmental authorisation submits a final report compiled in terms of these Regulations to the competent authority, the EAP must give registered I&APs access to, and an opportunity to comment on the report in writing. However, after review of the abovementioned documents it was found that the EAP did not comply with the above provision and had submitted the reports to the Department and I&APs at the same time (20/04/2016)".

Table 1.3 DEA Letter of Rejection Requirements

DEA REQUEST	COMMENT	REVISED FEIAR SECTION
The EAP must ensure that the assessment of impacts, the environmental impact assessment process and the requirements of the public participation process (PPP) is conducted in accordance with Regulations 54 to 57 of GN R. 543 of the EIA Regulations, 2010	The assessment of impacts, the EIA process and the requirements of the PPP has been and will continue to be conducted in accordance with the EIA regulations, 2010.	Public Participation Section Volume II – Public Participation Report
The EAP must ensure that all concerns raised in the EIA process have been adequately addressed in the final E!Ars. In particular, the concerns from BirdLife SA and any other I&AP that had an objection especially with regard to avifauna.	All comments and concerns raised during the EIA process has been considered, addressed and responded to in this Revised Final EIA Report. Concerns raised by BLSA and other I&APs regarding avifauna, has been taken into consideration by the EAP and the applicant. The concerns raised during the PPP of the draft EIA report, resulted in the applicant initiating an additional 12 months of bird monitoring on the site focussed around Verreauxs' Eagle. The results of which have advised the new layout and reduced the number of turbines from 98 to 35.	Section 8.5, 10.3 and Volume III Specialist Studies – Part II – Addendum to Avifauna Impact Assessment Report – Additional 12 Months Monitoring and Updated Impact Assessment.
The EIArs must meet the requirements of the acceptance of the SR letter, this rejection letter and the requirements of Regulation 31 of the EIA Regulations, 2010	This Revised Final EIA Report has addressed the requirements of the scoping report acceptance letter.	Table 1.2 indicated the DEA requirements and the Section in the Report the requirements have been addressed.
The following information must form part of the EIArs as well as a separate document for ease of reference: -An amended application form with an indication of all the 2010 listed activities that are still listed and this must specify the relevant sub listed activities; -An indication of all the similarly listed 2014 activities and this must specify the relevant sub listed	This will be submitted to the department together with the Revised Final EIARs.	Section 2.1

DEA REQUEST	COMMENT	REVISED FEIAR SECTION
activities; -An indication if there are any new 2014 activities that are listed; -An indication where in the report all the 2014 activities have been assessed and mitigated for; and -A letter/affidavit from the EAP indicating that the above is true and correct.		
The final EIArs must include a comments and response report as per the requirements of the Regulations.	A comments and response report has been compiled as per the regulations and included as part of this Revised Final EIA Report	Volume II – Public Participation Report.
The EAP must provide the exact comment provided by a specific interested and affected party in the comments and response report and address the respective comment before moving to the next comment. The EAP should not generalise and categorise the comments raised by I&APs.	The EAP has provided the exact comment and responded to each comment individually. The EAP has not generalised or categorised comments.	Volume II – Public Participation Report.
The final EIArs must include all responses made by the EAP to the representations, comments and views raised by I&APs.	This has been included.	Volume II– Public Participation Report.
Copies of the final EIArs must be circulated to all key stakeholders, Organs of State and registered I&APs for a duration of 30 days for comment. The issues raised by I&APs must be addressed in a table format indicating the issue/concern raised and the EAP's response thereto and must include copies of the I&APs' correspondence as well as a copy of this Department's rejection letter	All registered I&APs will be notified of the 30 day comment period and copies of the report will be made available for review and comment. The rejection letter has been included in the Revised Final EIA Report. all issues and comment raised during the 30 day comment period will be included in the Revised Final Report submitted to the DEA for authorisation, and will be in a table format.	Appendix C – Letter of Rejection from DEA.
The EAP must provide proof that all registered I&APs have been notified of the availability of the final EIArs. On receipt of the abovementioned information, this Department will reconsider the report in accordance with Regulation 30(1) of the EIA Regulations, 2010.	Proof of notification of the availability of the Revised Final EIA Report will be included in the submission to the DEA.	This will be included in Volume II – Public Participation Report.

2 LEGAL ENVIRONMENTAL FRAMEWORK

The EIA process is prescribed by the Environmental Impact Assessment Regulations (Government Notice R.543 in Government Gazette 33306 of 18 June 2010), which were introduced through Chapter 5 of the National Environmental Management Act (Act No. 107 of 1998) (NEMA). The regulations also comprise three listing notices (Government Notice R.544, R.545 and R.546).

Since the submission of the application for the proposed development the EIA Regulations have been amended (GN R. 982, 983,984 and 985 of 04 December 2014). As part of the scoping acceptance requirements the DEA requested that the proposed development take into consideration those changes relevant to it and assess them within this impact assessment report. This section of the report addresses this, and compares the 2010 listed activities and the 2014 listed activities relevant to the proposed project. This section further shows if any 2014 activities related to the proposed project, which were not considered in the 2010 regulations. If this was the case, it shows where in the report, it was addressed and assessed.

Other relevant legislation that has informed the scope and content of this Final Impact Assessment Report include:

- Constitution of the Republic of South Africa (Act No. 108, 1996);
- National Environmental Management Act (Act No. 107, 1998);
- Environmental Conservation Act (Act No. 73, 1989);
- National Heritage Resources Act (Act No. 25, 1999);
- National Environmental Management: Biodiversity Act (Act No 10, 2004);
- National Environmental Management: Air Quality Act (Act No. 39, 2004);
- Conservation of Agricultural Resources Act (Act No. 43, 1983);
- National Water Act (Act No. 36, 1998);
- Aviation Act (Act No. 74, 1962);
- National Environmental Management: Waste Act (Act No. 59, 2008);
- National Forest Act (Act No. 84, 1998);
- National Environmental Management: Protected Areas Act (Act No. 57, 2003); and
- National Roads Act (Act No. 7, 1998);
- Astronomy Geographic Advantage Act (Act No. 21 of 2007);
- Mineral and Petroleum Resources Development Act (Act No. 28 of 2002);
- Performance Standards and Equator Principles (IFC, June 2013);
- Independent Communications Authority of South Africa Act (Act No. 13 of 2000; as amended).

2.1 Listed Activities in the EIA Regulations

All listed activities which potentially form part of the proposed project, and which require environmental authorisation, are included in the application for Environmental Authorisation prepared and submitted to the DEA. As per the DEA requirements, the 2010 listed activities and the 2014 listed activities have been considered in this report. The activities are indicated in Table 2.1 below.

Any Environmental Authorisation which is obtained from the DEA can cover only those specific listed activities for which applications were made. To ensure that all listed activities that could potentially be required are covered by the Environmental Authorisations, a precautionary approach was followed when identifying listed activities in the application for Environmental Authorisation form, i.e., if an activity could potentially form part of the proposed project, it is listed. Any changes to this list will be notified in writing to the DEA, and I&APs will also be informed accordingly. An amended application form is being submitted to the DEA together with the final EIAR.

The table below, includes listed activities that are applicable to the proposed project, according to the NEMA EIA Regulations: Amended 04 December 2014, as requested by the DEA.

Table 2.1 Listed Activities Relevant to the Proposed WEF Phase 2

2010 NEMA EIA Regulations			2014 NEMA EIA Regulations		
#	Description of Listed Activities	Triggered	#	Description of Listed Activities	Triggered
GN R.544 10 (i)	The construction of facilities or infrastructure for the transmission and distribution of electricity – (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kV.	NO 33 kV electrical reticulation will be installed to transfer the electricity from the turbines to the 33/132 kV on-site substation. The powerlines will be installed underground where possible.	GN R.983 11 (i)	The construction of facilities or infrastructure for the transmission and distribution of electricity – (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kV.	NO 33 kV electrical reticulation will be installed to transfer the electricity from the turbines to the 33/132 kV on-site substation. The powerlines will be installed underground where possible.
GN R.544 11 (iii) (x) and (xi)	The construction of: (iii) bridges; (x) buildings exceeding 50 m² in size; or (xi) infrastructure or structures covering 50 m² or more; where such construction occurs within a watercourse or within 32 m of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	YES The internal roads will include a minimum of eight water crossings, some of which may require bridges to be constructed within a watercourse. The footprint of the turbines and associated infrastructure will exceed 50 m², *but a 32 m buffer around all watercourses has been applied for buildings and infrastructure.*	GN R.983 12 (iii) (x) and (xi)	The construction of- (iii) bridges exceeding 100 square meters in size; (x) buildings exceeding 100 square meters in size; (xii) infrastructure or structures with a physical footprint of 100 square meters or more; where such development occurs – (a) within a watercourse; or (c) if no developments setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.	YES The internal roads include a minimum of eight water crossings, some of which may require bridges to be constructed within a watercourse. Some of these may exceed 100 m². The footprint of the turbines and associated infrastructure will exceed 50 m², *but a 32 m buffer around all watercourses has been applied for buildings and infrastructure.*
GN R.544 13	The construction of facilities or 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 but not exceeding 500 m³.	NO Fuel and transformer oil will be stored on site during construction and operation, however the combined capacity will not exceed 80 m³.	GN R.983 14	The construction of facilities or 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 but not exceeding 500 cubic metres.	NO Fuel and transformer oil will be stored on site during construction and operation, however the combined capacity will not exceed 80 m³.

GN R.544 18 (i)	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from - (i) a watercourse	YES New bridges may need to be constructed or expanded for the construction phase of the WEF, the result of which would mean that there may be removal or moving of soil, sand, pebbles or rock of more than 5 cubic metres from - (i) a watercourse	GN R.983 19	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from - (i) a watercourse	YES New bridges may need to be constructed or expanded for the construction phase of the WEF, the result of which would mean that there may be removal or moving of soil, sand, pebbles or rock of more than 5 cubic metres from - (i) a watercourse
GN R.544 23 (ii)	The transformation of undeveloped, vacant or derelict land to – (ii) residential, retail, commercial, recreational, industrial or institutional use, outside an urban area and where the total area to be transformed is bigger than 1 hectare but less than 20 hectares;	NO The project is located on currently undeveloped land. The combined footprint of the turbines, laydown areas, road and electrical reticulation, on-site office and substation will be more than 20 hectares.	GN R983 27	The clearance of an area of 1 hectares or more but less than 20 hectares of indigenous vegetation, except where such clearance is required for (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	NO The project is located on currently undeveloped land. The combined footprint of the turbines, laydown areas, on-site office and substation will be more than 20 hectares.
GN R.544 24	The transformation of land bigger than 1000 m² in size, to residential, retail, commercial, industrial or institutional use, where, at the time of the coming into effect of this Schedule or thereafter such land was zoned open space, conservation or had an equivalent zoning.	NO There is no land zoned as open space, conservation or equivalent within the proposed development site.	GN R983 28 (ii)	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 01 April 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.	YES The majority of the proposed development site is currently used for agriculture, lies outside an urban area and the land to be developed will be bigger than 1 hectare.
GN R.544 26	Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	POSSIBLY At present this section of the NEMBA is not yet defined so it does not apply at this time.	GN R.983 30	Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	POSSIBLY
GN R.544 27 (ii)	The decommissioning of existing facilities or infrastructure, for – (ii) electricity transmission and	NO No existing facilities or infrastructure for electricity	GN R.983 (i), (ii)	The decommissioning of existing facilities, structures or infrastructure for (i) any	NO

	distribution with a threshold of more than 132kV.	transmission or distribution will be decommissioned.	(iii), (iv) and (v)	development and related operation activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014; (ii) any expansion and related operation activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014; (iii) any development and related operation activity or activities and expansion and related operation activity or activities listed in this Notice or Listing Notice 3 of 2014; or (v) any activity regardless the time the activity was commenced with, where such activity: (a) is similarly listed to an activity in (i), (ii), (iii), or (iv) above; and (b) is still in operation or development is still in progress	No existing facilities, structures or infrastructure will be decommissioned.
GN R.544 38	The expansion of facilities for the transmission and distribution of electricity where the expanded capacity will exceed 275 kilovolts and the development footprint will increase.	NO An expansion of transmission capacity at Gamma Substation will be required at the tie in to the national grid but the development footprint will not increase.	GN R.983 47	The expansion of facilities for the transmission and distribution of electricity where the expanded capacity will exceed 275 kilovolts and the development footprint will increase.	NO
GN R.544 39 (iii)	The expansion of (iii) bridges; within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, where such expansion will result in an increased development footprint.	YES The internal roads will include a minimum of eight water crossings, some of which may require existing farm bridges to be expanded.	GN R.983 48 (iii)	The expansion of (iii) bridges where the bridge is expanded by 100 square meters or more in size; where such development occurs – (a) within a watercourse; (b) in front of a development setback; or (c) if no developments setback exists, within 32 metres of a	YES The internal roads include a minimum of eight water crossings, some of which may require existing farm bridges to be expanded. Some of these may exceed 100 m^2.

				watercourse, measured from the edge of a watercourse.	
GN R.544 47 (i) and (ii)	The widening of a road by more than 6 m, or the lengthening of a road by more than 1 km – (i) where the existing reserve is wider than 13,5 m; or (ii) where no reserve exists, where the existing road is wider than 8 m.	Yes Where roads are present and may require widening for access reasons during construction this clause may be applicable. However, it is unlikely that any large roads will be affected.	GN R.983 56 (i) and (ii)	The widening of a road by more than 6 m, or the lengthening of a road by more than 1 kilometre – (i) where the existing reserve is wider than 13.,5 metres; or (ii) where no reserve exists, where the existing road is wider than 8 metres.	Yes
GN R.545 1	The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 MW or more.	YES Construction of a wind energy facility up to 147 MW in installed capacity. The facility will be comprised of individual, spatially separated, turbines with an individual generating capacity of 1.5 – 4.5 MW each.	GN R.984 1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more.	YES
GN R.545.15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 Ha or more.	YES The project is located on currently undeveloped land the combined footprint of the turbines, laydown areas, internal roads and substation will exceed 20 hectares.	GN R.984 15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance plan.	YES
GN R.546 4	The construction of a road wider than 4 m with a reserve less than 13.5 m (d) In Western Cape: (ii) All areas outside urban areas;	YES Access tracks will be required between the turbines and other infrastructure onsite. These will be unsealed and up to 9 m wide during construction, but will be	GN R.985 4	The development of a road wider than 4 metres with a reserve less than 13.5 metres. (f) in Western Cape: (i) areas outside urban areas; (aa) areas containing indigenous vegetation	YES Access tracks will be required between the turbines and other infrastructure onsite. These will be unsealed and up to 9 m wide during construction, but will be

		reduced to max. 6 m width during operation. The proposed site falls outside of urban areas.			reduced to max. 6 m width during operation. The proposed site falls outside of urban areas and contains indigenous vegetation.
GN R.546 10	The construction 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 m³ (e) In Western Cape: (ii) All areas outside urban areas;	NO Storage of fuel on the site will be required however the volume of this storage is will be below 30 m^2.	GN R.985 10	The development 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.	NO
GN R.546 12 (b)	The clearance of an area of 300 m^2 or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation. (b) Within critical biodiversity areas identified in bioregional plans	NO Critical Biodiversity Areas (CBAs) were identified during the EIA process and considered in the layout of the proposed development, so that no roads or turbines will fall within a CBD. Some of the proposed turbine positions are on the border of a CBA, however any clearance of vegetation required surrounding these will not exceed 300 m^2	GN R.984 12 (a) (ii)	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. (a) In Western Cape province: (ii) Within critical biodiversity areas identified in bioregional plans	NO
GN R.546. 13 (a) (b) (c) (bb) (cc)	The clearance of an area of 1 Ha or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation (a) Critical biodiversity areas and ecological support areas as identified in systematic biodiversity plans adopted by the competent authority (b) National Protected Area Expansion Strategy Focus Areas (NPAESFA)	NO Clearing of vegetation within a CBA will not exceed 1 Ha. The study area covers a small portion that falls within the Karoo Escarpment Grassland (NPAESFA) of the Western Cape Province, however clearing of vegetation within this will not exceed 1 Ha.	GN R.984 15 (c) (i)	The transformation of land bigger than 1000 square metres in size, to residential, retail, commercial, industrial or institutional use, where, such land was zoned open space, conservation or had an equivalent zoning, on or after 02 August 2010 (c) in Western Cape: (i) Outside urban areas	NO The proposed development site does not include any land zoned as open space, conservation or equivalent.

	(c) In the Northern Cape and Western Cape: ii. Outside urban areas, in (bb) National Protected Area Expansion Strategy Focus Areas (NPAESFA); (cc) Sensitive areas as identified in an environmental management framework as contemplated in Chapter 5 of the Act and as adopted by the competent authority				
GN R.546 14 (a) (i)	The clearance of an area of 5 Ha or more of vegetation where 75% or more of the vegetative cover constitutes indigenous Vegetation....(a) In Western Cape: (i) All areas outside urban areas.	YES Clearance of vegetation will be required for construction of the turbine foundations, hardstands, substation and road network in areas with 75 % or more of indigenous vegetation and this will exceed 5 ha.			
GN R.546 16	The construction of: (iii) buildings with a footprint exceeding 10 m² in size; or (iv) infrastructure covering 10 m² or more; where such construction occurs within a watercourse or within 32 m of a watercourse, measured from the edge of a watercourse; (d) In the Western Cape: (ii) Outside urban areas, in: (bb) National Protected Area Expansion Strategy Focus Areas (NPAESFA).	NO A 32 m buffer was applied to all watercourses during the design phase as embedded mitigation, so that no construction of buildings or infrastructure will take place within this buffer.	GN R.984 14 (iii) (x) and (xi) (a) and (c) (f) (i) (bb) and (ff)	The development of (iii) bridges exceeding 10 square meters in size; (x) buildings exceeding 10 square metres in size and (xi) infrastructure or structures with a physical footprint of 10 square metres or more; Where such development occurs – (a) within a watercourse and (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse. (f) In Western Cape: (i) outside urban areas, in: (bb) National Protected Area Expansion	YES Bridges may need to be constructed over watercourses exceeding 10 m² in size. The development site area covers a small portion that falls within the Karoo Escarpment Grassland (NPAESFA) of the Western Cape Province, no development will occur in this area. No required water crossings fall within a Critical Biodiversity Area.

				Strategy Focus (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans	
GN. R.546 19	The widening of a road by more than 4 m, or the lengthening of a road by more than 1 km (d) In the Western Cape: (ii) All areas outside urban areas	YES Where existing tracks/roads exist within the site these maybe widened or lengthened to facilitate the access tracks of 4-9m which will be used to access the turbines. These access tracks will be up to 9 m wide during construction, but will be reduced to 4-6 m during operation.	GN R.984 18 (a)	The widening of a road by more than 4 metres; or the lengthening of a road by more than 1 kilometre (f) In Western Cape: (i) All areas outside urban areas: (aa) Areas containing indigenous vegetation	YES

2.2 Overview of the EIA Process

NEMA promotes the use of scoping and impact assessment in order to ensure the integrated environmental management of activities.

Section 24(1) of NEMA states:

"In order to give effect to the general objectives of integrated environmental management laid down in this Chapter, the potential impact on the environment of listed activities must be considered, investigated, assessed and reported to the competent authority charged by this Act with granting the relevant environmental authorisation."

EIA is ultimately a decision-making process with the specific aim of selecting an option that will provide the most benefit, and cause the least impact. The EIA process should identify activities which may have a detrimental effect on the environment, and which would therefore require Environmental Authorisation prior to commencement.

The EIA process commences with formally notifying the DEA (the competent authority for renewable energy developments) of the proposed development by the submission of application forms. Following the notification, the EAP, along with the team of technical specialists, will commence the scoping phase, in order to inform decisions of the appropriate "scope" of the EIA process. This involves establishing the existing environmental baseline of the site proposed for development, considering the type of development and its potential impacts on the existing environment, and therefore determining what potential impacts should be assessed and how, within the EIA process. The EAP therefore compiles a Draft Scoping Report which is made available for public and stakeholder comment for a prescribed consultation period. All comments received in response to the DSR was be considered and as appropriate incorporated into the FSR and PSEIA.

The FSR and PSEIA has been submitted to the DEA, as the competent authority, for approval. Interested and Affected Parties (I&APs) were able to comment on the FSR and PSEIA by submitting their comments directly to the DEA.

This marks the formal end of the scoping phase, after which the EAP undertakes the EIA and compiles the Draft EIA Report (DEIAR) which was then, like the Draft Scoping Report, made available for public and stakeholder comment for a period of 40 days. Any comments were considered and incorporated as applicable into the Final EIA Report (FEIAR). I&APs were notified of the availability of the FEIAR and advised that should they like to comment on the report, they must submit their comments directly to the DEA (contact details of the DEA are included in the notification documents).

Once a FEIAR has been submitted, the competent authority (the DEA) will make a decision on whether to grant or refuse Environmental Authorisation.

2.3 The Impact Assessment and Reporting Phase

The primary objective of the environmental impact assessment and reporting phase (EIA phase) is to present sufficient information to the competent authority (CA) and interested and affected parties (I&APs) on predicted impacts and associated mitigation measures required to avoid or mitigate negative impacts, as well as to improve or maximise the benefits of the project.

This must include addressing issues raised in the scoping phase, an assessment of alternatives to the proposed development in a comparative manner, an assessment of identified impacts and a determination of their significance, as well as a formulation of mitigation measures.

In terms of legal requirements, Regulations 31, 32 and 33 of the NEMA EIA Regulations of 18 June 2010 which came into effect on 2 August 2010 relate to the EIA phase. These sections regulate and prescribe the content of the EIA Report and specify the type of supporting information that must accompany the submission of the report to the authorities. Table 2.3 shows how and where the legal requirements are addressed in this FEIAR. In addition, Regulations 54 to 57 relate to the Public Participation Process (PPP) and, specifically, the registration and recording of submissions from I&APs. Appendix II of this FEIA Report contains the PPP undertaken. Comments received up to and during the commenting phase on the DEIAR were collated and included in the issues and response report in the FEIAR.

The Revised FEIAR presents a summary of the findings and recommendations of all specialist reports in Chapters 8 and 9, 11 and 12 as well as comments received.

Table 2.3 Legal Requirements for Environmental Impact Assessment Reports

Section	Requirement for EIA Report	Where this is provided
31 (2)(a)(i)	Details of the EAP who prepared the report	Section 1.4.1
31 (2)(a)(ii)	Details of the expertise of the EAP to carry out an environmental impact assessment	Section 1.4.1
31 (2)(b)	Description of the proposed activity	Chapter 7
31 (2)(c)	Description of the property on which the activity is to be undertaken and the location of the activity on the property, or if it is:	Chapter 8
31 (2)(c)(i)	A linear activity, a description of the route of the activity	n/a
31 (2)(d)	A description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity	Chapter 8 and 11
31 (2)(e)	Details of the public participation process conducted in terms of sub-regulation (1), including:	Chapter 13 Volume II
31 (2)(e)(i)	Steps undertaken in accordance with the plan of study	All specialists reports have been adapted to included separate impact assessments for each of the four components of the proposed development, as per the DEA scoping acceptance letter. Section 2
31 (2)(e)(ii)	A list of persons, organisations and organs of state that were registered as interested and affected parties	Volume II
31 (2)(e)(iii)	A summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments	Volume II
31 (2)(e)(iv)	Copies of any representations and comments received from registered interested and affected parties	Volume II
31 (2)(f)	A description of the need and desirability of the proposed activity	Chapter 5

Section	Requirement for EIA Report	Where this is provided
31 (2)(g)	A description of the identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity	Chapter 6
31 (2)(h)	An indication of the methodology used in determining the significance of potential environmental impacts	Section 2.4
31 (2)(i)	A description and comparative assessment of all alternatives identified during the environmental impact assessment process	Chapter 6
31 (2)(j)	A summary of the findings and recommendations of any specialist report or report on a specialised process	Chapter 9 and 11 Volume III
31 (2)(k)	A description of the environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures	Chapter 9 and 11
31 (2)(l)	An assessment of each identified potentially significant impact, including	Chapter 9 and 11
31 (2)(l)(i)	Cumulative impacts	Chapter 10 and 12
31 (2)(l)(ii)	The nature and extent of the impact	Chapter 9 and 11
31 (2)(l)(iii)	The extent and duration of the impact	Chapter 9 and 11
31 (2)(l)(iv)	The probability of the impact occurring	Chapter 9 and 11
31 (2)(l)(v)	The degree to which the impact can be reversed	Chapter 9 and 11
31 (2)(l)(vi)	The degree to which the impact may cause irreplaceable loss of resources; and	Chapter 9 and 11
31 (2)(l)(vii)	The degree to which the impact can be mitigated	Chapter 9 and 11
31 (2)(m)	A description of any assumptions, uncertainties and gaps in knowledge	Chapter 9 and 11 Volume II
31 (2)(n)	A reasoned opinion as to whether the 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;	Chapters 14 and 15
31 (2)(o)	An environmental impact statement which contains (i) a summary of key findings of the environmental impact assessment; and (ii) a comparative assessment of the positive and negative implications of the proposed activity and identified alternatives	Chapter 14 and 15
31 (2)(p)	A draft environmental management programme containing the aspects contemplated in regulation 33	Appendix B
31 (2)(q)	Copies of any specialist reports and reports on specialised processes complying with regulation 32	Volume III
31 (2)(r)	Any specific information that may be required by the competent authority	This report
31 (2)(s)	Any other matters required in terms of sections 24(4)(a) and (b) of the Act	

Section	Requirement for EIA Report	Where this is provided
31 (3)	Detailed, written proof of an investigation as required by section 24(4)(b)(i) of the Act and motivation if no reasonable or feasible alternatives, as contemplated in sub regulation 31(2)(g), exist	Chapter 6
Requirements for specialist reports and reports on specialised processes		
32 (3)(a)	Details of the person who prepared the specialist report and their expertise	Volume III
32 (3)(b)	A declaration that the specialist is independent	Appendix A
32 (3)(c)	An indication of the scope of and the purpose for which the specialist report was prepared	Volume III
32 (3)(d)	A description of the methodology adopted in preparing the specialist report or carrying out the specialised process	Volume III
32 (3)(e)	A description of any assumptions made and any uncertainties or gaps in knowledge	Volume III
32 (3)(f)	A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment	Chapter 9 and 12 Volume III
32 (3)(g)	Recommendations in respect of any mitigation measures that should be considered by the applicant and the competent authority	Chapter 9 and 11 Appendix B (EMPr)
32 (3)(h)	A description of any consultation process that was undertaken during the course of carrying out the study	Chapter 13 Volume II
32 (3)(i)	A summary and copies of any comments that were received during any consultation process	Volume II
32 (3)(j)	Any other information requested by the competent authority	Volume II

2.4 Assessment Techniques for the EIA

Each of the specialist assessments follows a systematic approach to the assessment of impacts, with the principal steps being:

- Description of existing environment/baseline conditions;
- Prediction of likely potential impacts, including cumulative impacts (both positive and negative);
- Assessment of likely potential impacts (positive and negative);
- Identification of appropriate mitigation measures; and
- Assessment of residual (potential) environmental impacts.

2.4.1 Baseline Description

In order to evaluate the potential environmental impacts, information relating to the existing environmental conditions were collected through field and desktop research; this is known as the baseline. Climate change is expected to affect the proposed development site over the lifetime of the proposed development; however, the nature, scale and severity of climate change effects are uncertain. Given this uncertainty, the existing environment is assumed to remain constant throughout the lifetime of the proposed development, and forms the current and future baseline for the impact assessments.

The baseline was used to determine the sensitivity of receptors on and near the proposed grid connection site and what changes may take place during the construction, operation and decommissioning of the proposed grid connection and the impacts, if any, that these changes may have on these receptors.

Within each specialist assessment, the methods of data collection have been discussed with the relevant I&APs. Data was collected from public records and other archive sources and where appropriate field surveys were also carried out.

2.4.2 Identification of Potential Impacts

The identification of potential impacts covers the three phases of the proposed development: construction, operation and decommissioning. During each phase, the potential environmental impacts may be different.

The project team have experience from environmental studies for other projects in the locality of the proposed development as well as other WEFs. The team are therefore able to identify potential impacts addressed in the EIA based on their experience and knowledge of the type of development proposed and the local area. Their inputs informed the scope for the EIA.

Each specialist assessment considered:

- The extent of the impact (local, regional or (inter) national);
- The intensity of the impact (low, medium or high);
- The duration of the impact and its reversibility;
- The probability of the impact occurring (improbable, possible, probable or definite);
- The confidence in the assessment; and
- Cumulative impacts.

Following identification of potential environmental impacts, the baseline information was be used to predict changes to existing conditions, and permit an assessment of the impacts associated with these changes.

A detailed description of the assessment methodology used is presented in Appendix C.

2.4.3 Assessment of Potential Effects

The potential impact that the proposed WEF may have on each environmental receptor could be influenced by a combination of the sensitivity and importance of the receptor and the predicted degree of alteration from the baseline state (either beneficial or adverse).

Environmental sensitivity (and importance) may be categorised by a multitude of factors, such as the rarity of the species; transformation of natural landscapes or changes to soil quality and land use.

The overall significance of a potential environmental impact is determined by the interaction of the above two factors (i.e., sensitivity/importance and predicted degree of alteration from the baseline).

2.4.4 Cumulative Assessment

By definition, cumulative impacts are those that result from incremental changes caused by past, present or reasonably foreseeable future actions together with the proposed development. Cumulative impacts are the combined impacts of several developments that are different to the impacts from the developments on an individual basis. For example the landscape impact of one WEF may be insignificant, but when combined with another it may become significant.

New proposals for wind energy development have been stimulated by the policy support shown by the South African Government through the implementation of the Renewable Energy Independent Power Procurement programme ("REIPPPP"). The impact of all existing WEFs, approved developments and applications received, within a 100 km radius, was considered in the EIA. The impacts of the proposed development in combination with other approved developments, or developments for which applications have been received, are specifically assessed in the cumulative impacts section of this Final EIAR. The appropriate extent of cumulative work relevant to each specialist assessment was agreed during the consultation process.

As the proposed development is one of four components of the proposed Umsinde Emoyeni WEF as detailed in Section 1.1 there is potential for cumulative impacts between the four components. As such, the impact of the proposed development is assessed both individually, and cumulatively.

2.4.5 Mitigation

The EIA proposes measures to avoid, reduce or remedy significant adverse impacts which were identified; these are termed mitigation measures. Where the assessment process identified any significant adverse impacts, mitigation measures were proposed to reduce those impacts where practicable. Such measures include the physical design evolutions such as movement of turbines and management and operational measures. Design alterations such as the route of the servitude to avoid certain sensitive receptors are mitigation embedded into the design of the proposed development, i.e., embedded mitigation.

This strategy of avoidance, reduction and remediation is a hierarchical one which seeks:

- First to avoid potential impacts;
- Then to reduce those which remain; and
- Lastly, where no other measures are possible, to propose compensatory measures.

Each specialist consultant identified appropriate mitigation measures (where relevant).

2.5 Consultation and Participation

2.5.1 EIA Phase Process

Public participation takes place throughout the EIA process (which includes the Scoping phase and the EIA phase). The main purpose of the Public Participation Process (PPP) is:

- To identify I&APs that will be affected by the proposed development;
- To identify parties that have an interest in the proposed development and/or the environment under consideration;
- To establish a record of the procedure by which I&APs were identified and afforded the opportunity to participate at all appropriate stages of the process;
- To provide opportunities to I&APs to express their views regarding the scope and content of the environmental reports, including alternatives and issues that are being investigated;
- To provide an opportunity for I&APs to verify that their issues were included and considered in the EIA; and
- To maintain a record of all correspondence and views of I&APs.

Evidence of consultation conducted to date is included in Appendix II. Details on the public participation process during the scoping phase, including public consultation events, notifications and scoping phase consultations with authorities can be found in the Final Scoping Report.

I&AP Identification

The identification of I&APs and/or stakeholders has been carried out in three separate tasks, namely:

- Those identified during the screening process (i.e., by review of available stakeholder information);
- Those identified as directly affected landowners within the proposed development site; and
- Those who registered as a result of the advertising and notification process.

Landowners have been identified through three main mechanisms, namely:

- Available databases from previous projects within the vicinity of the proposed development site;
- Landowner information obtained from a detailed deeds search; and
- One on one consultation with the landowners within the proposed development site.

Occupiers of the affected and adjacent land portions were encouraged throughout the process to participate. Due to the proposed development site covering such a large area, it was difficult to gain access to speak to each individual occupier of the affected and adjacent land portions. Given the lack of interest or comments from land occupiers, it was decided that additional effort should be given to gain comments from them. To this end EIMS undertook to contact the land owners firstly through a notification, asking for assistance from them to supply the contact details for their occupiers of the land, secondly, each land owner was contacted telephonically to gain the contact details. Evidence of this as well as the results of this communication can be found in Volume II – Public Participation Process.

It is the professional opinion of the Public Participation professional (EIMS) as well as the EAP (Arcus) that this is a more than reasonable effort at bringing all affected farm occupiers into the EIA process and including their concerns and comments into the Final Report.

It is acknowledged that it is a difficult exercise to identify and engage with all occupiers as many of them are spread across farms but it is felt that through telephonic conversations, information posters and focus meetings with occupiers held during the EIA phase, that adequate public participation has been undertaken. Volume II includes the minutes of all focus group meetings.

I&APs are registered on a Microsoft Excel database which has been split into a landowner database and a database containing the information of all other key stakeholders (referred to as key I&APs). The I&AP databases include the full contact details of all parties identified and contacted during the EIA process and all parties who replied to advertisements and other notices, or contacted the PPP consultant regarding the proposed development.

The I&AP databases has been expanded and updated throughout the EIA process.

Issues and Responses Report

An Issues and Responses Report (IRR) has been compiled for the proposed development. This report represents a "living" record of the public consultation process. The IRR captures the following information:

- Date of comment/question;
- Method of comment/question (e.g., public meeting, letter, etc.);
- Name and organisation of the person who made the comment/asked the question;
- The comment/question. The IRR will be grouped according to the themes of the issues and concerns raised; and

- An answer to the question/response to the comment or a reference as to where such information may be obtained in the Scoping Report and EIR.

The DEIAR was released for a 40 day public review & comment period. All I&APs on the I&AP databases (landowners and key I&APs) were notified in writing, via letter, fax and/or email of the availability of the DEIAR for review. The following methods were utilised to notify registered I&APs of the availability of the DEIAR and associated public meeting to present the findings of the report:

- The DEIAR was made available for public review at the Murraysburg local municipal office, Murraysburg Farmers' Co-operative, and the Richmond police station, the Ubuntu and Beaufort West local municipalities, as well as the website (www.eims.co.za). The comment period for reviewing the DEIAR was 40 days; with an additional 10 days given to I&AP's that requested an extension.
- Notification letters, faxes and/or emails were distributed to registered I&APs (including all affected landowners) regarding the availability of the DEIAR for comment; and
- A public meeting to present findings of the DEIAR was arranged and the details thereof included in the notification regarding the availability of the DEIAR.
- The public meeting was held at Murraysburg town hall on 04 February 2016.

The FEIAR will then be finalised and notifications issued to all registered I&APs via letters, faxes and/or emails regarding the submission of the FEIAR to the DEA. In addition I&APs will be informed of any material changes made to the DEIAR which are incorporated in the FEIAR. I&APs will have an opportunity to comment on the FEIAR, with any comments submitted directly to the DEA (details of where and to whom to send such comments will be included in the FEIAR availability notification letter).

Copies of the FEIAR will be placed at the Murraysburg local municipal office and Farmers' Co-operative as well as the Richmond police station and library. The FEIAR will also be available at the Ubuntu and Beaufort West local municipalities and on the project website (www.eims.co.za).

All environmental documentation will be made available to the competent authority (the DEA) as well as the:

- Western Cape Department of Environmental Affairs and Development Planning (DEADP);
- Northern Cape Department of Environmental Affairs and Nature Conservation (DENC);
- Beaufort West Local Municipality; and
- Ubuntu Local Municipality.

This step marks the end of the EIA Phase. Once the DEA has reviewed the FEIAR, they will make a decision on the report and subsequently decide on whether or not to grant the Environmental Authorisation.

2.5.1.1 Ongoing Communication

Throughout the project, stakeholders are encouraged to get into contact with the PPP team to raise issues, ask questions or make suggestions. Communication can be via telephone or in written form. Once a contact has been made, the issue/question/suggestion will be logged on the Issues and Responses Report and a response will be provided to the stakeholder.

Registration of I&APs continues throughout the EIA process however comments on the DEIAR need to be received within the specified time periods to ensure they can be taken into account in the FEIAR.

2.5.2 Additional Review and Comment Period

As mentioned, in September 2017, the DEA rejected the submission of the FEIAR, in accordance with Regulation 34(1)(a) of the EIA Regulations, 2010. The letter states:

"In terms of Regulation 56(2) of the EIA Regulations, 2010 before the EAP managing an application for environmental authorisation submits a final report compiled in terms of these Regulations to the competent authority, the EAP must give registered I&APs access to, and an opportunity to comment on the report in writing. However, after review of the abovementioned documents it was found that the EAP did not comply with the above provision and had submitted the reports to the Department and I&APs at the same time (20/04/2016)". A copy of the letter is included in Appendix C of thei Revised FEAIR.

The EAP acknowledges this oversight and as such this Revised Final EIA Report is being made available to all registered I&APs for a period of 30 days for review. All comments received will be collated and submitted to the DEA together with this Report for authorisation. The 30 day comment period is from 09 February 2018 to 10 March 2018.

2.5.2.1 Informing stakeholders of the Decision to Grant or Refuse Environmental Authorisation

After submission of this Revised Final EIA Report, the relevant competent authority (DEA) will issue an Environmental Authorisation, should the project be approved. Notification regarding the DEA's decision and the appeal procedure will be distributed to all registered I&APs within 12 days of the issuing of the decision. This task will include the advertisement of the Environmental Authorisation in the same newspapers used to advertise the initial project notifications.

3 REVIEW OF APPLICABLE PLANS AND POLICIES RELATING TO RENEWABLE ENERGY

The following section has been produced using the Social Impact Assessment Specialist Report, it provides a high level review of policy and planning documentation at a national, provincial and municipal level relevant to the proposed development, and in support of renewable energy facilities. A full description of each of these policies and plans can be found in Volume III – Specialists Studies.

3.1 Renewable Energy Independent Power Producer Procurement Programme (REIPPPP)

The REIPPPP is the mechanism which the DoE has provided for Independent Power Producers (IPPs), that is private companies, to develop, construct and operate renewable energy facilities in South Africa. Renewable energy in terms of the REIPPPP includes projects making use of any onshore wind, solar photovoltaic, biomass, biogas, landfill gas, or small hydro technologies.

The REIPPPP is essentially a selection process whereby the DoE evaluates potential renewable energy developments proposed by the IPP's through a competitive bidding process.

The bid is first evaluated to confirm it is compliant with the bidding requirements. This includes having completed the EIA and received an Environmental Authorisation from the competent authority. Compliant bids are then evaluated against the two main criteria: price of electricity from the project (the tariff) and its economic development commitments.

In terms of the project's economic development commitments, bidders must demonstrate how a project would contribute towards elements such as job creation, local content and local manufacturing, rural development and community involvement, education and development of skills, enterprise development, socio-economic development and participation by historically disadvantaged individuals (HDIs). Reporting to demonstrate compliance with commitments made by the project over the life of the project is a strict requirement of the REIPPPP.

The most competitive compliant projects are awarded "Preferred Bidder Status" adjudicated on a 70/30 split between the tariff and project's economic development commitments.

The proposed development is intended to be submitted in Round 5 of the REIPPPP bidding process.

3.2 Policies and Plans

In the SIA the following national, provincial and local level policy and planning documents were reviewed, namely:

3.2.1 National

- National Energy Act (2008);
- White Paper on the Energy Policy of the Republic of South Africa (December 1998);
- White Paper on Renewable Energy (November 2003);
- Integrated Resource Plan (IRP) for South Africa (2010-2030);
- The National Development Plan (2011);
- New Growth Path Framework (2010); and
- National Infrastructure Plan (2012).

3.2.2 Provincial and local

- White Paper on Sustainable Energy for the Western Cape Province (2010);
- The Western Cape Provincial Strategic Plan 2014-2019 (2014);
- The Western Cape Land Use Planning Act, 2014;
- The Western Cape Provincial Spatial Development Framework (2014 Revision);
- The Western Cape Climate Change Response Strategy (2014);
- The Western Cape Infrastructure Framework (2013);
- The Western Cape Green Economy Strategy Framework (2013);
- The One Cape 2040 Strategy (2012);
- The Western Cape Amended Zoning Scheme Regulations for Commercial Renewable Energy Facilities (2011);
- The Western Cape Draft Strategic Plan (2010);
- The Strategic Initiative to Introduce Commercial Land Based Wind Energy Development to the Western Cape – Towards a Regional Methodology (2006); and
- The Guidelines for the Management of Development on Mountains, Hills and Ridges in the Western Cape (2002).
- Central Karoo District Municipality Integrated Development Plan (2012-2017);
- Beaufort West Local Municipality Integrated Development Plan (2012-2017).
- Northern Cape Provincial Growth and Development Strategy (2004-2014);
- Northern Cape Climate Change Response Strategy;
- Northern Cape Spatial Development Framework;
- Pixley ka Seme District Municipality Integrated Development Plan (2012-2015);
- Pixley ka Seme District Municipality Spatial Development Framework (2011); and
- Ubuntu Local Municipal Integrated Development Plan (2012-2107).

The findings of the review indicated that renewable energy is strongly supported at a national and local level. At a national level the White Paper on Energy Policy (1998) notes:

Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future; and

The support for renewable energy policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind and that renewable applications are in fact the least cost energy service in many cases; more so when social and environmental costs are taken into account.

The IRP 2010 also allocates 43 % of energy generation in South Africa to renewables, while the New Growth Path Framework and the National Infrastructure Plan both support the development of the renewable energy sector.

The development of and investment in renewable energy is also supported by the National Development Plan (NDP), New Growth Path Framework and National Infrastructure Plan, which all make reference to renewable energy. At a provincial level the development of renewable energy is supported by the Northern Cape Provincial Growth and Development Strategy, Northern Cape Provincial Spatial Development Framework, White Paper on Sustainable Energy for the Western Cape, Climate Change Strategy and Action Plan for the Western Cape and Western Cape Growth and Development Strategy.

The findings of the review of the relevant policies and documents pertaining to the energy sector therefore indicate that the renewable energy is supported at a national and provincial level. It is therefore the opinion of the authors that the establishment of the proposed wind energy facility is supported by relevant policies and planning documents. However, the provincial and local policy and planning documents also make reference to the importance of tourism and the region's natural resources. Care therefore needs to be taken to ensure that the development of large renewable energy projects, such as the proposed facility, does not impact on the region's natural resources and the tourism potential of the province.

3.3 International

3.3.1 International Finance Corporation (IFC) Equator Principles (2013)

The Equator Principles are a *risk management framework, adopted by financial institutions, for determining, assessing and managing environmental and social risk in projects and is primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making*[2]*.*

Large-scale infrastructure projects have the potential to result in adverse social and environmental impacts. The Equator Principles, are guidelines adopted by financial institutions involved in the financing of such projects to ensure projects they invest in are developed in a responsible manner. The Equator Principles acknowledge that adverse impacts on ecosystems, communities and climate should be avoided where possible.

The Equator Principles require that an "assessment" takes place to address relevant environmental and social risks, and include measures to minimise, mitigate and offset adverse impacts. This assessment process should comply with the legislative requirements of the Republic of South Africa in relation to the proposed development, and also the applicable IFC Performance Standards. A list of the Performance Standard is provided below:

1. Assessment and Management of Environmental and Social Risks and Impacts;
2. Labour and Working Conditions;
3. Resource Efficiency and Pollution Prevention;
4. Community Health, Safety and Security;
5. Land Acquisition and Involuntary Resettlement;
6. Biodiversity Conservation and Sustainable Management of Living Natural Resources;

[2] Equator Principles available online at http://www.equator-principles.com/

7. Indigenous Peoples; and
8. Cultural Heritage.

4 THE PROPOSED DEVELOPMENT OF UMSINDE EMOYENI WEF PHASE 1 AND 2 AND ASSOCIATED ELECTRICAL GRID CONNECTION PHASE 1 AND 2

This section of the report provides a description of the proposed development, and how the proposed project is related to the overall development. There are four components to the proposed development, comprising the WEF and associated grid connection, representing two development phases.

- Umsinde Emoyeni WEF: Phase 1;
- Electrical Grid Connection and Associated Infrastructure for Umsinde Emoyeni WEF Phase 1;
- Umsinde Emoyeni WEF: Phase 2 (the 'proposed project'); and
- Electrical Grid Connection and Associated Infrastructure for Umsinde Emoyeni WEF Phase 2.

The two phases of the WEF will each be located within the WEF site boundary as shown on Figure 1.2. One of the two phases of the grid connection will start within the WEF site boundary and continue into the grid site boundary. The other will only be within the WEF site boundary. The grid connections are each assessed separately in their own EIA report.

The capital expenditure for Phase 1 and 2 will be in the region of R 5 billion (2015 Rand value).

4.1 The Proposed Development Site Location

The proposed development site (referred to in this report as the WEF site boundary and the grid site boundary) is located near the town of Murraysburg in the Western Cape Province, with a small portion of the proposed development site transcending into the Northern Cape Province.

The majority of the proposed development site is located within the Beaufort West Local Municipality (BWLM), which is one of three local municipalities that make up the Central Karoo District Municipality (CKDM) in the Western Cape Province. A small section of the proposed development site is also located in the Ubuntu Local Municipality within the Northern Cape Province. The proposed development site is located approximately 7 km northeast of the closest settlement, the town of Murraysburg.

The location of the proposed development site is shown on Figure 1.1.

4.2 Description of the Proposed Development Site

The proposed development site occupies hilly terrain with ephemeral and seasonal drainage features. The altitude varies between 1200 m and 1900 m above mean sea level from west to east with the geology dominated by mudstone, shale and sandstone with numerous dolerite intrusions. The majority of the site is characterised by a land use dominated by extensive sheep grazing with small occurrences, generally to the south, of crop production in alluvial deposits in drainage features. The soils are generally shallow and the annual rainfall is low (approximately 300 mm) and erratic.

The Brak River is the principal watercourse on the proposed development site, running through the far western part. A number of tributaries of the Brak River also flow through the proposed development site, namely:

- Skietkuilspruit (far western part of the grid connection site);
- Snynderskraal River (eastern part of the grid connection site, to the west of the WEF boundary);

- Buffels River (from east to west through the southern part of the WEF site);
- Bakensklip (from east to west, through the northern part of the WEF site); and
- Several unnamed tributaries.

The N1 national road passes through the far western part of the proposed development site, in a southwest-northeast orientation, where it intersects the R63 regional route. The R63 runs from Victoria West (to the northwest) to Graaff-Reinet (to the southeast) through Murraysburg and passes through the southern part of the proposed development site. Three other minor local roads pass through the proposed development site in a northerly direction towards Richmond; one through the grid site (to the west of the WEF Site), one through the centre of the WEF Site and one which passes in and out of the eastern WEF Site (Figure 1.1)

The proposed development site covers a total area of approximately 94 000 hectares (WEF Phase 1 and 2 and Grid connection Phase 1 and 2), of which only a small proportion will be occupied by the final proposed development footprint (it is envisioned that at most 1 - 2 percent of the site will be disturbed)

The proposed development site boundary comprises the following farm parcels:

- Portion 0 (Remaining Extent) Of Farm No. 28 (Swavel Kranse)
- Portion 1 Of Farm No. 29 (Hout Kloof)
- Portion 2 (Kapoksfontein) Of the Farm De Hoop No. 30
- Portion 3 (a portion of Portion1) Of the Farm De Hoop No. 30
- Portion 1 of the Farm Matjeskloof No. 27
- The Farm Voetpad No. 51
- Remaining Extent of Farm 30 (De Hoop)
- Portion 7 (De Tafel)(Portion of Portion 2) of the Farm Driefontein No. 26
- Portion 1 of the Farm MiddelValy No. 52
- Remainder of the Farm Klein Driefontien No. 152
- Portion 3 (portion of portion 1) of the Farm Driefontein No. 26
- Remainder of portion 2 of the Farm Driefontein No. 26
- Portion 10 (a portion of Portion 1) of the Farm Driefontein No. 26
- The Farm Rhenosterfontein No. 50
- Portion 7 (a portion of Portion 6) of the Farm Witteklip No. 32
- Portion 1 of Farm Klein Driefontein No.152
- Portion 2 (portion of portion 9) of the Farm Witteklip No. 32
- Remainder of Portion 1 (Springfontein) of the Farm De Hoop No. 30
- Portion 4 of the Farm De Hoop No. 30
- Portion 4 (a portion of portion 1) of the Farm Driefontein No 26
- Portion 2 (Hartebeesfontein) of the Farm Swavel Kranse No 28
- Remainder of the Farm Leeuwenfontein No. 6
- Portion 2 of the Farm Leeuwenfontein No. 6
- Remainder of Portion 1 (Zwaggershoek-Success) of the Farm Leeuwenfontein No. 6
- Portion 2 (portion of portion 1) of the Farm Allemansfontein No. 7
- Portion 3 (Voorspoed) (Portion of portion 1) of the Farm Leeuwenfontein No. 6
- Portion 4 (Spes Bona) (a portion of portion 1) of the Farm Allemansfontein No. 7
- The Farm Klein Los Kop No. 5
- Portion 3 (Rooi Koppies) of the Farm Driefontein No. 8
- Remainder of the Farm Driefontein No. 8
- Portion 1 (Krieger's Fontein) of the Farm Driefontein No. 8
- The Farm Riet Poort No. 9
- Portion 3 of the Farm Badfontein No. 10
- Remainder of the Farm Schietkuil No. 3

- Portion 2 of the Farm Schietkuil No. 3

- Richmond RD
- Portion 1 of the farm Klipplaat No 109[3]
- Portion 3 (portion of Portion 2) of the farm Klipplaat No 109[1]
- Portion 4 (Annex Klipplaat) (a portion of portion 2) of the Farm Klipplaat No 109
- Portion 7 (Middelste Rivier) of the Farm Klipplaat No 109
- Portion 6 Of Farm 109 (Klipplaat)
- The Remainder of Portion 2 of the Farm Klipplaat No. 109
- The Remainder of the Farm Klipplaat No.109

It should be noted that not all of the above mentioned farm portions will be affected by the proposed development, but that these represent the area that has been assessed.

4.3 Transportation of Components

A Transportation Risk Assessment was undertaken for the proposed development. The complete report can be found in Volume III of the EIA report. This section contains a summary of the report. A complete transportation management plan will be undertaken prior to construction, should the project be awarded preferred bidder status.

4.3.1 Main Transport Corridors

The N1 national road that bisects the Central Karoo is a key transport corridor for road-based freight transport, passenger services and private vehicles. This vital link bisects South Africa on a northeast-southwest axis, providing access to and between Limpopo Province, Gauteng, the Free State and the Western Cape. Within the Central Karoo District it links the towns of Beaufort West, Leeu-Gamka, Laingsburg and Matjiesfontein. This road is part of the SANRAL network.

The R61 road which provides access to the Eastern Cape branches off at Beaufort West and goes via Aberdeen or Murraysburg. A second main road transport route, the N12, connects to the N1 south of Beaufort West, providing a link to Oudtshoorn and George. The R63 trunk road connects to the N1 in the northeast of the area and passes to the south through Murraysburg and on to Graaff-Reinet, and to the north, to Victoria West in the Northern Cape. Running parallel to the N1 through the Central Karoo is the long-distance main railway line connecting Cape Town to Johannesburg / Pretoria and the other main urban centres of South Africa.

Wind turbine components can be transported in a number of ways with different truck / trailer combinations and configurations. These issues which will be investigated at a later stage when the transporting contractor and the plant hire companies apply for the necessary permits from the permit issuing authorities.

4.3.2 Nacelle

The heaviest component of a wind turbine is the nacelle (approximately 67 to 85 tons depending on manufacturer and design of the unit). Combined with road-based transport, it has a total vehicle mass of approximately 130 000 kg (for the 85 ton unit). Thus route clearances and permits will be required for transporting the nacelle by road based transport (see example of a road based transport below).

[3] Please note that these properties are recorded on the title deed as being in the Richmond RD, Northern Cape Province, however they are in the Murraysburg RD Western Cape Province. The project applicant is assisting the landowner to have the title deed amended so as to reflect the correct Registration Division and Province.

Plate 1: Road-based Transport

4.3.3 Blades

These are the longest component, ranging between 45 – 60 m, and need to be transported on a specially imported extendible blade transport trailer or in a rigid container with rear steerable dollies. The blades can be transported individually, in pairs or in three's although different manufacturers have different methods of packaging and transporting the blades. The transport vehicle exceeds the dimensional limitations (length) of 22 m and will be allowed under permit provided the trailer is fitted with steerable rear axles or dollies.

Plate 2: 3 x 45 m Blades on extendible Trailers

4.3.4 Tower Sections

The approximately 78 m – 140 m high tower, when assembled, consists of 4 to 5 x approximately 20 m sections varying between 2773 mm and 4190 mm in diameter. Each section is transported separately on a low-bed trailer. Depending on the trailer configuration and height when loaded, some of these components may not meet the dimensional limitations (height and width) but will be permitted under certain permit conditions (see examples below).

Plate 3: 20 m Tower Section on low-bed tri-axial Trailer (Very little ground clearance)

Plate 4: 20 m Tower Section (Better ground clearance)

4.3.5 Transporting Cranes, Mobile Cranes and Other Components

4.3.5.1 Option 1: Crawler Crane & Assembly Crane

One possible option is that the main lift crane that would be capable of performing the required lifts, i.e. lifting the tower sections (of between 29 – 52 tons) into position, lifting the nacelle (83 tons) to + 80 m hub height and lifting the rotor and blades into place, will need to be similar to the Liebherr Crawler Crane LR1750 with a SL8HS (Main Boom and Auxiliary Jib) configuration. A smaller 200 ton Liebherr Mobile Crane LTM 1200-5.1 is also required to lift the components and assist in the assembly of the crawler crane at each turbine location.

Crawler Crane LR1750 with the SL8HS boom system (Main Lifting Crane):

The Crawler Crane will be transported to site in stripped configuration and the heaviest load will be the superstructure and crawler centre section (83 tons). The gross combination mass (truck, trailer and load) will be approximately 133 049 kg. The boom sections, counterweights and other equipment will be transported on conventional tri-axle trailers and then assembled on site and will need a number of truckloads of parts to be mobilised in order to perform the heavy lifts.

Mobile Crane LTM 1200-5.1 (Assembly Crane):

The Liebherr LTM 1200-5.1 crane is a 5 axle vehicle with rubber tyres and will travel to site under its own power. However the counterweights will be transported on conventional tri-axle trailers and then assembled on site. The assembly crane is required to assemble the main lift crane as well as assist in the installation of the wind turbine components.

4.3.5.2 Option 2: GTK 1100 Crane & Assembly Crane

For the wind turbine behind Coega, the GTK 1100 hydraulic crane was used. The GTK 1100 was designed to lift ultra-heavy loads to extreme heights and its potential lies in being deployed on facilities such as wind turbine farms.

Plate 5: Hydraulic GTK 1100 Crane

A key benefit of the GTK 1100 is its fast set-up due to the vertical rigging of the self-erecting tower and it can be operational in four to six hours. The crane has a small footprint of 18 m x 18 m (including the boom set-up) for a minimised job site area and its self-levelling function results in minimal ground preparation. In addition, the crane can operate at these heights with very heavy loads of up to 100 tons without a counterweight. The GTK 1100 can be transported on four truckloads including 2 abnormal trailers (for the boom and crane).

Mobile Crane LTM 1200-5.1 (Assembly Crane):

As above - a smaller 200 ton Liebherr Mobile Crane LTM 1200-5.1 is also required to lift the components and assist in the assembly of the hydraulic crane at each turbine location.

In addition to transporting the specialised lifting equipment, the normal civil engineering construction materials, plant and equipment will need to be brought to the site (e.g. sand, stone, cement, concrete batching plant, gravel for road building purposes, excavators, trucks, graders, compaction equipment, cement mixers, transformers in the sub-station, cabling, transmission pylons etc.). Other components such as electrical cables, pylons, substation transformers will also be transported to site during construction.

4.3.6 Port of Entry

Two ports where assessed by Jeffares and Green as possible entry points for imported wind turbine components, Coega and Cape Town. The preferred option will be Coega, as this port is closer to the site, in terms of travel distance than Cape Town.

This port is a relatively new facility and has handled a Vestas V90 Turbine unit that has been installed on the hill behind Coega. The port has large areas available for leasing as storage areas and good access to the local road network.

There are various options for offloading and handling the components, but the most economical would be to commission a bulk carrier with on-board cranes to offload onto transport vehicles and taken directly to site or placed in a leased storage area at the port.

This port is very well equipped to handle the receiving and storage of components.

4.3.6.1 Transportation from Port to Site

Where required, existing public roads may need to be upgraded along the proposed equipment transport route to allow for the transportation and delivery of wind turbine components and other associated infrastructure components.

The national roads on the potential national access routes are generally of high standard and many of the structures have been assessed for load bearing capacity and height clearance in the past.

The roads along the local access routes (such as the R75 and R63) seem to be generally in good condition. The local access routes will have to be inspected via visual assessment by the contractor prior to construction as there are several passes with sharp bends and gradients that might exceed the possible maximum gradient for an abnormal loads truck to manage as well as low Telkom or other lines. It is recommended to approach the site from the south (from the R63).

Turbine supplier/s or the contractor selected for implementation would be responsible for the transportation of wind turbine components to site.

5 NEED AND DESIRABILITY OF THE PROPOSED WIND ENERGY FACILITY (INCLUDING THE PROPOSED PROJECT)

Wind energy facilities can play a role in mitigating or reducing climate change, addressing South Africa's energy resource constraints and producing low-cost energy. In addition, operational wind energy facilities in South Africa contribute significantly to the economic development of the areas in which they are located through the requirements of the REIPPPP adjudication process. Section 5 highlights the national, provincial and local plans and policies that are in support of renewable energy facilities. Through this documentation, it is demonstrated that at all levels of governance, policy supports the development of renewable energy in order to address energy supply issues, and to promote economic growth in South Africa.

Reference is made to the Western Cape Department of Environmental Affairs and Development Planning's 2010 Guideline on Need and Desirability[4] which states that while the "concept of need and desirability relates to the type of development being proposed, essentially, the concept of need and desirability can be explained in terms of the general meaning of its two components in which need refers to time and desirability to place – i.e. is this the right time and is it the right place for locating the type of land-use/activity being proposed? Need and desirability can be equated to wise use of land – i.e. the question of what is the most sustainable use of land."

In other words it answers the question of whether the activity is being proposed at the right time in the right place. The guidelines pose a number of questions that should be considered in this investigation, which are addressed in the section below. These are further expanded in Sections 5.1 – 5.6. This section of the report was completed post impact assessment by specialists.

The proposed development's land use is in line with the relevant Spatial Development Framework and projects and programmes identified as priorities by the credible IDP.

- The National Development Plan (NDP) – Vision for 2030 (National Planning Commission, 2011) identifies 'energy' as a key area for investment in infrastructure, with an objective of at least 20 000MW of capacity to come from renewable sources.

[4] DEA&DP's (2010) Guideline on Need and Desirability, EIA Guideline and Information Document Series. Western Cape Department of Environmental Affairs & Development Planning (D:EA&DP).

- The Western Cape Spatial Development Framework (SDF) names energy diversification as a key policy that must be pursued. It states that emergent IPPs and sustainable energy producers must be supported and encouraged to thrive in the rural areas as means to uplift stagnating economies. It also encourages and supports renewable energy generation at scale for climate change mitigation.
- The proposed development is in line with the Beaufort West Local Municipality Integrated Development Plan (IDP), which states 'Basic Service delivery and infrastructure development' including electricity, as well as local economic development as key performance areas.

Development of this type of land use should occur here at this point in time.

- The proposed development itself will not cause a significant change in land use, as the development site is primarily low intensity agriculture (sheep grazing), which can still proceed once the development is constructed.
- The proposed the Umsinde Emoyeni WEF will contribute positively towards the creation of employment and local economic development, in an area with high levels of unemployment and low levels of economic growth. The area is not suitable for alternative more profitable types of land use.
- The NSP, SDF and IDP call for the promotion of energy infrastructure and renewable energy in particular.

The community and area need the activity, which is a societal priority.

- The NDP identifies energy infrastructure as a key investment area and the country is facing a national energy crisis.
- The region suffers from a stagnating economy with low levels of economic growth and high unemployment rates. The Western Cape SDF supports energy developments particularly in these rural areas to combat this problem. The proposed development of the Umsinde Emoyeni WEF will create jobs and contribute towards socio-economic development in an area with otherwise few opportunities.

There is adequate capacity for the required services currently available and no additional capacity must be created to cater for the development.

- The existing Eskom Gamma Substation is able to provide connection to the national grid, and the connecting Ishwati Emoyeni WEF through or to which the grid connection will run has received Environmental Authorisation, but currently under appeal.
- Any water required during construction will be sourced from existing boreholes or if additional water is required this would be delivered in by tankers.
- Waste removal will be in accordance with best practice as per the EMPr by qualified waste removal contractors to the nearest registered landfill.
- Portable sanitation facilities will be utilised during construction, so that no connection to the local sewerage system will be required.

The proposed development is not provided for in municipal planning, however the overall effect will be beneficial to the municipality.

- Any additional infrastructure required will be provided and maintained by the applicant. There is therefore no cost involved to the municipality.
- The land has low agricultural potential and the economic yield is currently low. The construction of the proposed Umsinde Emoyeni WEF will lead to an increased income for the property owners of the land that the servitude and WEF are on.

The proposed development is part of a national programme to address an issue of national concern.

- The National Integrated Resource Plan for Electricity (IRP2) (2011) states that 42 % of the national electricity supply should come from renewable energy sources by 2030. The proposed development will contribute towards this goal.
- The proposed development of Umsinde Emoyeni WEF fall under the National Infrastructure Plan.

The proposed development is the best practicable environmental option for this site.

- The proposed development of Umsinde Emoyeni WEF will contribute towards lower carbon emission goals to combat climate change and provide cleaner energy than coal which currently makes up the large majority of the national energy mix.
- The current land use is non-arable, low-potential grazing land with a low per m^2 yield. Therefore the opportunity cost of not proceeding is high in terms of yield per m^2.
- The preferred alternative minimises negative environmental impacts.

The approval of this application will not compromise the integrity of the existing approved and credible municipal IDP and SDF as agreed to by the relevant authorities.

- The Beaufort West IDP supports the improvement of the local electricity supply and the improvement of electrical infrastructure, as well as local economic development, which the proposed activity will contribute to.
- The proposed development is supported by the Western Cape SDF, which promotes IPPs and renewable energy developments.

The approval of this application will not compromise the integrity of the existing environmental management priorities for the area.

- Throughout the EIA process Critical Biodiversity Areas (CBAs), ecological priority areas as well as sensitive areas and no-go areas in the proposed development site were identified through specialist input. The presented alternatives avoid these areas and considered these in the design of the proposed grid connection as well as the design of the Umsinde Emoyeni WEF turbine layout. Therefore any negative environmental impacts are minimised. Mitigation measures have been identified to further minimise negative impacts.

Location factors favour this land use in this area.

- The region was identified through a wind mapping process as being extremely favourable for wind energy facilities in terms of wind resources. A variety of alternative locations were considered and this process is detailed in this EIA Report (Section 5.1). In addition rood road access, favourable terrain and landowner support were factors contributing to site selection.
- Land use will not change significantly as low intensity grazing can continue in the area post-construction.

The predicted impacts on sensitive natural and cultural areas will be of overall low-medium significance with the implantation of mitigation measures.

- Detailed specialist impact assessments were conducted through the EIA process which identified potential impacts and predicted their significance. No-go and sensitive areas were identified and the design of the Umsinde Emoyeni WEF took these into consideration. Any future layout changes will also adhere to these identified no-go areas.
- Mitigation measures were identified by the specialists that minimise environmental impacts and lower the significance rating of these impacts.

The proposed development will have an impact of low negative significance on people's well-being and a medium negative impact on visual receptors.

- The SIA found any health risks (noise, shadow, flicker and electro-magnetic radiation) from the proposed Umsinde Emoyeni WEF to be of low negative significance.
- The impact of noise associated with the Umsinde Emoyeni WEF was determined as of low negative significance by the noise impact specialist study.
- The visual impact of the proposed development will be of medium negative significance with mitigation measures as determined by a specialist study on visual impacts.

Positive social impacts of the proposed development will outweigh negative social impacts.

- The social impact assessment (SIA) found the construction phase to have a mediaum positive impact with enhancements on creation of employment and business opportunities, and the operational phase to have a medium positive significance.
- The establishment of a community trust funded by the proposed development would be of high positive significance with enhancements.
- The promotion of clean, renewable energy will have a medium positive impact on the region.
- The impact of a benefit from technical advice for local farmers associated with the proposed development was assessed as of low positive significance in the SIA.
- Improved cell phone reception resulting from the proposed development would be of low positive significance.
- The presence of construction workers and an influx of job seekers associated with the construction phase of the proposed development would both be of low negative significance to local communities with mitigation.
- The risk to safety, livestock and farm infrastructure would be of very low negative significance with mitigation, and the risk of grass fires would be of low negative significance with mitigation.
- Impacts associated with construction vehicles would be of low negative significance.
- The impact on farmland and loss of productive land would be of very low negative significance with mitigation.
- The impact on tourism by the proposed development will be of low negative significance

The proposed development infrastructure will not result in unacceptable opportunity costs.

- The current land use is low-intensity grazing and the land is not suitable for other agricultural uses. The yield per m2 is very low.
- The proposed development will increase the yield per m^2 as the landowners will be paid for the use of their land. This could increase agricultural investments in the area.
- The opportunity cost of not proceeding with the proposed development is therefore high.

It is likely that the proposed development will have negative and positive cumulative impacts

- Cumulative impacts are assessed in Section 10 of this report. Should mitigation recommendations supplied by each specialists not be applied appropriately the proposed development combined with other facilities proposed in 100km radius has the potential to have high combined negative cumulative impacts on biodiversity.

The proposed development will impact on the sense of place

- The social impact assessment, the visual impact assessment as well as the heritage impact assessment have all taken this into account in their assessment report.

- The proposed related infrastructure, such as powerlines, access roads, substation and O&M buildings may result in potential visual intrusion of the industrial infrastructure on the Karoo's rural 'sense of place'.
- The visual impact and the significance thereof associated with a 140 MW WEF on the areas sense of place is likely to vary from individual to individual.
- Visual impact associated with the proposed WEF and the potential impact on the areas rural sense of place from a social perspective.
- Although this landscape has been assigned a high grade in terms of its quality, the proponent has gone to some lengths to design both phases 1 and 2 to involve the most inhospitable and remote parts of the project area which means that much of the high scenic amenity value areas will be conserved albeit that elements of the proposed facilities will be visible. Farms situated on the valley floors will probably not be seriously impacted to changes in sense of place, although the overall natural qualities of the project areas and aesthetic qualities will be impacted.
- The remoteness of areas selected for especially phase 1 of Umsinde Emoyeni has mitigated somewhat this impact.

The proposed land use will not set a precedent.

- The proposed development will not lead to a change in the current agricultural land use in the area. The zoning, should the development be constructed, will be amended from agriculture to agriculture 1.
- The adjacent Ishwati Emoyeni WEF has been granted environmental authorisation (currently under appeal), and will most likely be constructed should it be awarded preferred bidder status.

The proposed development infrastructure will not affect any person's rights.

- Section 24 of Chapter 2 (The Bill of Rights) of The Constitution of South Africa states that everyone has the right to an environment that is not harmful to their wellbeing, 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 developments
- The proposed Umsinde WEF will contribute towards the prevention of pollution and ecological degradation as well as the promotion of sustainable development and use of natural resources through the Umsinde Emoyeni WEF. Wind energy has a much smaller carbon footprint than coal, which is currently the dominant form of electricity generated in South Africa.

The proposed development will not compromise the 'urban edge'.

- The proposed development is outside of any urban areas. The closest town is Murraysburg, which is 7 km away.

5.1 Wind Resource at Umsinde Emoyeni

Wind energy projects are characterised by a number of additional factors, besides the wind resource, that make a particular site a viable alternative. These include topography, proximity to and capacity of the national electricity grid, site accessibility, availability of land and land use, as well as possible environmental and permitting constraints. The site selection process undertaken (see Site Selection and Alternative Section below) took into account a high-level assessment of various opportunities and constraints which may be applicable at a regional level before narrowing its focus on potential individual wind energy facilities at a local and site specific level.

WDSA identified several potential project sites by considering the available wind resource data using wind mapping technology and a suite of world-leading atmospheric modelling and wind energy prospecting tools such as WindScape™ and RaptorNL™. These tools are proprietary software that has been developed by Windlab's WindScape Institute in Australia, one of the world's leading wind mapping institutions. This in-house capability enables WDSA to identify regions with promising wind resource at a very early stage of the project with significantly higher certainty than would be possible otherwise, thereby improving the ability to identify economically viable sites. Once a site has been identified a 'Virtual Wind Farm' is modelled to understand the potential for a wind farm project at the site.

The wind resource in the area and on these sites specifically is competitive by national and international comparison. This is evidenced by the awarding of projects by the Department of Energy on neighbouring properties as well as data collected by on-site meteorological masts. Windlab has monitored the wind speeds at the site with 4 tall monitoring towers and 2 sonic based measurement systems (SODARs) since August 2012. The analysis of the data shows that the wind speeds at the site are in excess of 7.5 m/s at all monitoring locations (with all but one location above 8 m/s). This is well above the wind speeds recorded at many projects that are currently in operation or construction in South Africa. The fairly unidirectional wind allows for the placement of turbines in close proximity to each other along the top of ridges with a reduced internal wake effect. This further supports productivity and efficiency and reduced impact. Umsinde Wind Energy Facility is ideally located for energy generation.

Based on their preliminary assessment of the wind resource from these measurements, EWFP have determined that the proposed Umsinde Emoyeni Wind Energy Facility would generate sufficient energy to support an economically viable wind energy project.

5.2 Climate Change

The scientific consensus on climate change is that climate is changing and that these changes are in large part caused by human activities[5]. Of these human activities, increase in carbon dioxide (CO_2) levels due to emissions from fossil fuel combustion is regarded as a significant contributor to anthropogenic climate change.

South Africa is one of the world's largest emitters of CO_2 in absolute and per capita terms.

The following climate change impacts have been predicted in relation specifically to South Africa[6]:

- South Africa's coastal regions will warm by around 1-2°C by about 2050 and around 3-4°C by about 2100;
- South Africa's interior regions will warm by around 3-4°C by about 2050 and around 6-7°C by about 2100;
- There will be significant changes in rainfall patterns and this, coupled with increased evaporation, will result in significant changes in respect of water availability;
- Our biodiversity will be severely impacted, especially the grasslands, fynbos and succulent Karoo where a high level of extinction is predicted;
- Small scale and homestead farmers in dry lands are most vulnerable to climate change and although intensive irrigated agriculture is better off than these farmers, irrigated lands remain vulnerable to reductions in available water;
- Some predictions suggest that maize production in summer rainfall areas and fruit and cereal production in winter rainfall areas may be badly affected;

[5] http://adsabs.harvard.edu/abs/2013ERL.....8b4024C
[6] http://www.cop17-cmp7durban.com/en/south-africa-on-climate-change/effects-of-climate-change-on-south-africa.html

- Commercial forestry is vulnerable to an increased frequency of wildfires and changes in available water in south-western regions;
- Rangelands are vulnerable to bush encroachment which reduces grazing lands;
- Alien invasive plant species are likely to spread more and have an ever-increasing negative impact on water resources;
- Although strong trends have already been detected in our seas, including rising sea levels and the warming of the Agulhas current and parts of the Benguela current, we are not yet sure what impacts these could have on our seas, the creatures living in the seas or on the communities dependant on the sea;
- Because of our already poor health profile, South Africans are specifically vulnerable to new or exacerbated health threats resulting from climate change. For example, some effects of climate change may already be occurring due to changes in rainfall (droughts and floods) and temperature extremes and Cholera outbreaks have been associated with extreme weather events, especially in poor, high density settlements;
- There will be an increase in the frequency and severity of extreme weather events. Damage costs due to extreme weather-related events (flooding, fire, storms and drought) have already been conservatively estimated at being roughly 1 billion rand per year between 2000 and 2009.

As explained in National Treasury's Carbon Tax Policy Paper (May, 2013)[7], addressing the challenges of climate change through facilitating a viable and fair transition to a low-carbon economy is essential to ensure an environmentally sustainable economic development and growth path for South Africa. Further the Policy Paper states that the South African government is of the view that South Africa needs to reduce its greenhouse gas emissions while working to ensure economic growth, increase employment, and reduce poverty and inequality[8].

Under the Copenhagen Accord[9], South Africa pledged in 2009 to ensure that its greenhouse gas emissions deviate from the business-as-usual growth trajectory by around 34 per cent by 2020 and 42 per cent by 2025.

Renewable energy projects will play a significant role in assisting the transition to a low-carbon economy.

5.3 Energy Constraint

South Africa faces major energy constraints, with the country's energy operating reserve margin i.e., the amount of electric generation resources planned to be available in the electricity generation system, as compared to the system's expected maximum demand for the year, of currently between 0 % - 5 %. Internationally, reserve margin requirements are usually kept at about 15 % of total demand. To ensure that South Africa's economy can continue to grow, the energy constraint can be addressed by constructing additional electricity generators.

WEFs in particular have a relatively short construction period when compared to other conventional generation technologies of the same scale, meaning that much-needed power can be added to the grid from WEFs in the short term.

5.4 Diversification and Decentralisation of Supply

With its abundant coal supplies, approximately 92.6 % of South Africa's energy needs are currently met through coal-fired generators, with nuclear energy contributing 5.7 % and

[7] National TreasuryCarbon Tax Policy Paper. Available online http://www.treasury.gov.za/public%20comments/Carbon%20Tax%20Policy%20Paper%202013.pdf

[8] http://www.treasury.gov.za/public%20comments/Carbon%20Tax%20Policy%20Paper%202013.pdf

[9] Copenhagen Accord https://unfccc.int/meetings/copenhagen_dec_2009/items/5262.php

the balance by pumped storage (1.2 %), hydroelectric (0.5 %) and gas turbines (0.1 %). Electricity generation is dominated by state-owned power company Eskom, which currently produces over 96.7 % of the power used in the country.[10]

A diversification of energy supplies, particularly with respect to renewable energy sources, would lead to greater energy security and economic and environmental benefits.

The deployment of various renewable technologies increases the diversity of electricity sources and, through local decentralised generation, contributes to the flexibility of the system and its resistance to central shocks.

According to the International Energy Agency, "*renewable energy resources … exist virtually everywhere, in contrast to other energy sources, which are concentrated in a limited number of countries. Reduced energy intensity, as well as geographical and technological diversification of energy sources, would result in far-reaching energy security and economic benefits.*"[11]

Progress in this regard has been made under the DoE REIPPPP (Section 3.1), with 64 approved wind, solar, small hydro and bioenergy projects at various stages of development in the first three bidding windows of the REIPPPP, including 1,984 MW of wind power. According to the DoE's Integrated Resource Plan for Electricity 2010-2030, South Africa is aiming to procure 9,200 MW of wind power by 2030. Further information on the REIPPPP and the Integrated Resource Plan are presented in Section 3.1 this Final EIA Report.

5.5 Reduced Cost of Energy

In terms of cost, wind energy is globally one of the cheapest forms of new generation capacity available[12]. Under the REIPPPP, the fully-indexed tariffs for wind energy projects have dropped from R1.15/kilowatt hour (kWh) to as low as 66.4 c/kWh, representing globally very competitive prices for energy generation. With Eskom currently producing power at 60 c/kWh and with electricity from the coal-fired power stations currently under construction expected to cost more than 97 c/kWh[13], wind energy is one of the lowest cost forms of new generation capacity in South Africa.

In addition to the levelised cost of developing, financing, constructing, operating and decommissioning energy generating facilities, all energy generators produce an external cost (or externality) such as the additional indirect costs incurred by society and the environment, including health, climate change, environmental, mining and water costs.

WEFs produce relatively small external costs when compared to other energy generation technologies. Any externalities can be considered positive in the form of local ownership of the project, local job creation and zero pollution resulting from Wind Farms.

5.6 Economic Development and Job Creation

The REIPPPP requires Economic Development ("ED") commitments from onshore wind energy projects and projects are adjudicated according to their ED commitments. The main ED beneficiaries of approved projects are currently communities living within a 50 km radius of renewable energy facilities. Projects are bid and thereafter adjudicated according to tariff (70 percent) and Economic Development (30 percent). There is therefore an incentive for projects to focus on Economic development of the local community and to assign as much

[10] http://www.usea.org/sites/default/files/event-file/497/South_Africa_Country_Presentation.pdf

[11] www.iea.org/textbase/npsum/ETP2012SUM.pdf

[12] https://about.bnef.com/press-releases/renewable-energy-now-cheaper-than-new-fossil-fuels-in-australia/
http://www.bloomberg.com/news/2013-02-06/australia-wind-energy-cheaper-than-coal-natural-gas-bnef-says.html
http://www.eia.gov/forecasts/aeo/electricity_generation.cfm

[13] http://mg.co.za/article/2012-08-24-00-eskom-grilled-on-power-price

revenue, jobs, procurement etc. to local people as well as South African companies and people as possible in order to stand a chance of having a successful project.

Projects are adjudicated according to the following points:

Economic Development Elements	Weighting
Job Creation	25 %
Local Content	25 %
Ownership	15 %
Management Control	5 %
Preferential Procurement	10 %
Enterprise Development	5 %
Socio-Economic Development	15 %
Total	**100 %**
Total points	**30 points**

A number of these elements will have a significant and positive impact on the Local Community.

In terms of job creation, bidders are required to indicate the actual number of jobs that will be created for South African citizens, Skilled People, Black People, Skilled Black People and Citizens from the Local Communities. Significant skilled and unskilled job opportunities will be created in the Local Communities, particularly during the construction period.

For Ownership, bidders are required to indicate the total shareholding of the Project Company in the hands of Black People and Local Communities. The minimum ownership percentage for Local Community is 2.5 % but projects have committed up to 40% Local Community Ownership in order to have a competitive project. Broad-based community trusts are established as a vehicle for Local Community Ownership to received dividend revenue from an operating project that will be invested in socio-economic development imperatives as determined by trustees. The ownership stake is funded either through debt or through equity partners ("a free-carry").

The Socio-Economic Development and Enterprise Development commitments require a percentage of gross revenue from the operating wind farm to be invested in education, health, small business development etc. Projects are required to commit at least 1 % of gross revenue towards socio-economic development. As an indication, 1 % of gross revenue of a 140 MW wind farm, with a capacity factor of 35 % and a tariff of 80 c/kWh would equal approximately R3.5 m/year (and R68 m over the 20 year operation period of a project). Projects in the REIPPPP receive additional points if the socio-economic and enterprise development investments are committed to be invested in the Local Community.

WEFs in South Africa will create skilled and unskilled jobs, particularly during the construction period. Under the REIPPPP, projects are incentivised to maximise the direct job creation opportunities, particularly for people in the communities surrounding the project.

WEFs tend to be constructed in rural areas with small communities and limited infrastructure and social amenities. A wind farm would create indirect jobs in accommodation, catering and other services that would support a wind farm and cater for the material and social needs of wind farm workers.

Localisation is considered one of the major contributors to job creation and general improvement of the economy of South Africa. Localisation through the construction of new manufacturing facilities to build wind turbine towers and other turbine components in South Africa is currently progressing.

Wind energy can provide technical skills to South Africans and thus improve the technical skills profile of the country and the regions where wind energy facilities are located. Through the REIPPPP, developers' own initiatives and through support from international donor agencies, a number of young South Africans are being trained on various aspects of wind farm construction and operation.

These projects, if successfully implemented, have the potential to transform for the better key development areas of South Africa and would assist South Africa meet its development goals while meeting its carbon emission reduction targets as per international protocols.

6 ALTERNATIVES ASSESSMENT

Alternatives are different means of meeting the general purpose and need of a proposed development and may include alternative sites, alternative layouts/designs, alternative technologies and/or the no development alternative.

Chapter 5 above has provided an introduction for the need for the development, including an explanation as to why wind energy can be considered in some regards, as a preferential alternative of meeting the need for increased electricity demand over other source of generation such as fossil fuel. This includes:

- Climate change;
- Energy constraint;
- Diversification and decentralisation of supply;
- Costs; and
- Economic Development.

Chapter 5 therefore demonstrates why wind energy can be considered a preferential alternative in terms of electricity generation. The following section considers the alternatives in relation to the proposed development site specifically.

The EIA Regulations indicate that alternatives that are considered in an assessment process should be reasonable and feasible and that I&APs should be provided with an opportunity to provide inputs into the process of formulating alternatives.

The assessment of alternatives should, as a minimum, include the following:

- The consideration of the No Development alternative as a baseline scenario;
- A comparison of reasonable and feasible selected alternatives; and
- The provision of reasons for the elimination of an alternative.

6.1 The No Development Scenario

The 'No Development' scenario assumes that the proposed development does not proceed. It is equivalent to the future baseline scenario in the absence of the proposed development.

Relative to the proposed development, the implications of the 'No Development' scenario include:

- The land-use remains agricultural with no further benefits derived from the implementation of a complementary land use;
- There is no change in the current landscape or environmental baseline;
- Whilst no WEF development will occur on site, other wind energy projects go ahead as planned in the vicinity of the site;
- No additional electricity will be generated on-site or supplied through means of renewable energy resources. This would have implications for the South African Government in achieving its proposed renewable energy target;
- There is no opportunity for additional employment in the local area where job creation is identified as a key priority; and

- The local Economic Development benefits associated with the proposed project's REIPPPP commitments will not be realised.

South Africa, like many nations in the world, faces serious electricity and water shortages due to its heavy dependency on fossil fuels and increase in demand. There is therefore a strong need for additional electricity generation options to be developed.

The purpose of the proposed development is to generate renewable electricity and export this to the national grid. Many other socio-economic and environmental benefits will result from the proposed development such as:

- Reduced air pollution emissions - burning fossil fuels generates CO_2 emissions which contributes to global warming. In addition burning fossil fuels produces emissions of sulphurous and nitrous oxides which are hazardous to human health and impact on ecosystem stability;
- Water resource saving – conventional coal fired power stations use large quantities of water during their cooling processes. WEFs require limited amounts of water during construction and almost no water during operation. As a water stressed country South Africa should be conserving such resources wherever possible;
- Improved energy security – renewables can often be deployed in a decentralised way close to consumers improving grid strength while reduce expensive transmission and distribution losses. They also contribute to a diverse energy portfolio;
- Exploit significant natural renewable energy resources – biomass, solar and wind resources remain largely unexploited;
- Sustainable energy solution – The uptake of renewable energy technology addresses the country's energy needs in a sustainable manner, generating electricity to meet growing demands in a manner which is sustainable for future generations.
- Employment creation and other local economic benefits associated with support for a new industry in the South African economy.

The 'No Development' alternative will not assist the government in addressing climate change, nor will it assist in supplying the increasing electricity demand within the country.

Climate change is widely considered by environmental professionals as one of the single largest threats to the environment on a local, national and global scale. As such, the 'No Development' alternative is not a preferred alternative.

The Social Impact Assessment found that the proposed development would create the potential for a positive effect of high significance for Murraysburg and BWLM with the establishment of a community trust and the No Development alternative would result in a lost opportunity of medium negative significance for Murraysburg and the BWLM, as well as for South Africa to supplement its current energy needs with renewable energy.

6.2 Site Selection Process and Criteria

Once a site has been identified as a possibility, Windlab model a 'Virtual Wind Farm' to understand the potential for a wind farm project at the site. If the site shows potential, the landowner is approached and the land secured by means of a long-term lease. Once this has occurred the next step is for Monitoring and Pre-feasibility.

During the Monitoring and Pre-feasibility stage a monitoring mast is erected on preferred project sites to measure on site wind. A minimum of 12-months data collection is required in order for the wind data to be considered bankable The Pre-feasibility part of this stage includes a range of preliminarily considerations which are investigated to evaluate the project sites:

1. Grid connection options and capacity availability on the existing national grid;
2. The feasibility of site access;

3. Technical construction issues such as geological conditions and topography;

4. Preliminary high level environmental considerations regarding the presence of internationally, nationally, provincial and local protected areas, identified heritage sites, hydrology (including perennial and no-perennial waterways, dams and wetlands, etc.), location of houses, roads etc. based on publically available data or preliminary on-site investigations. Publically available data is sourced from sources such as the Endangered Wildlife Trust (EWT), Cape Nature, Birdlife SA, SANBI, the avian sensitivity map, local wildlife groups and includes any other publically available georeferenced environmental data of South Africa. At this stage of a development initial consultation with key statutory and non-statutory organisations such as Birdlife SA, EWT and Provincial/National Department of Environmental Affairs may be completed. At some sites WDSA chooses to complete pre-feasibility bird and bat studies to collect preliminary information (Note: this does not form part of the 12-month bird or bat monitoring study).

Only if no initial, high level issues are identified, will projects proceed to the next stage.

The next stage is Full feasibility, which includes the scoping and EIA process. The aim of this phase is to address the project at a more detailed level, so as to advance the decision on if the project should proceed, and if so, what are the limitation and constraints to development. This includes consideration of key commercial, environmental, technical and legal issues. The aim of WDSA for this stage is to inform the decision that the site can be financed and constructed. Since WDSA makes a firm commitment towards the project at this point, this is a very important step in the selection process of project sites and the moment when the project is introduced into the public domain. The EIA is one of the key actions identifying site specific environmental feasibility and constraints at the Full Feasibility stage. The EIA therefore forms an important stage in informing the progression of the project, its design, and facilitates the introduction to the public.

In brief, the selection process is a detailed process of identification and elimination of sites and starts with identifying a potentially viable site through the presence of suitable wind resource. This is done at a macro scale using wind modelling techniques. Areas with favourable wind regimes at this scale can then be scaled down using more refined modelling techniques, and the process of ruling out sites through considering applicable constraints. Sites which are found to be suitable in terms of both wind resource and constraints, including environment considerations, are taken forward to the application for Environmental Authorisation through the EIA process.

WDSA has been and continues to develop a portfolio of sites across South Africa including sites in the Western Cape. The proposed development - Umsinde Emoyeni Project was selected out of WDSA's portfolio based on anticipated wind resource (high wind speeds), proximity to existing grid infrastructure, land availability, minimum technical constraints from a construction perspective and absence of high level environmental issues at the Monitoring and Pre-feasibility stage.

Further on-site wind monitoring is currently underway from four 80 m anemometer masts and several SODAR devices in order to confirm the wind resource on site and improve the accuracy of existing wind data as well as to inform the most efficient turbine layout. The preliminary project layout has been further evaluated and refined as part of the EIA process.

The table below provides further detail on the site selection process in relation to the proposed development, which was selected based on consideration of a range of potential sites at the time. This does not present the full WDSA portfolio of projects as this changes with time. It reflects the projects being considered at the time of selection of the Umsinde Emoyeni Project to be taken forward to the Full Feasibility stage, including the EIA process.

Table 1 Site Selection Process

	Site A	Site B	Site C	Site D	Site E	Site F	Site G	Site H	Site I	Umsinde Emoyeni
Location Descriptor	Western Cape	Western Cape	Eastern Cape	Eastern Cape	Western Cape	Western Cape	Northern Cape	Eastern Cape	Northern Cape	Western Cape/Northern Cape
Wind Resource	Good	Good	Good	Poor	Moderate	Good	Good	Good	Moderate	Good
Grid Connection	Long distance to grid connection but available	Limited connection capacity available	Available	Limited connection capacity available	Very limited connection capacity available	Very limited connection capacity available	Available	Available	Available	Available
Land Use and Land Availability	Suitable land use, ability to secure unknown	Some areas of cultivated land	Unable to secure	Suitable land use and able to secure	Some areas of cultivated land, unable to secure some parts of the area of interest	Suitable land use but limited land area available for a project	Secured by another developer	Suitable land use and able to secure	Suitable land use and able to secure	Suitable land use and able to secure
Site Access	Moderate	Good	Moderate	Good	Good	Good	Good	Good	Good	Good
Environmental Sensitivity	High sensitivity, close to protected areas, extreme visual sensitivity	High sensitivity, close to protected areas, extreme visual sensitivity, avian sensitivity concerns	Medium sensitivity	Low-medium sensitivity	Medium sensitivity, avian sensitivity concerns	Medium sensitivity but highly constrained	Medium sensitivity	Medium sensitivity	Medium sensitivity	Medium sensitivity
Status of Development	Not advanced	Not advanced	Not advanced	Not advanced	Not advanced	Not advanced	Not advanced	In progress, not ready to commence full feasibility phase	In progress, not ready to commence full feasibility phase	In progress, advanced to full feasibility phase

As is shown by Table 5 above, numerous alternative sites were discounted at the site selection process on both technical and environmental considerations. Sites H and I may also represent potential sites for the development of wind energy facilities in the future however at the time of selecting the Umsinde Emoyeni site, these projects were not suitable for progression into the Full Feasibility stage.

6.3 Design Evolution Alternatives

Following the selection of a suitable site using the process outlined above, consideration is given to the design of the wind energy facility within that site. The purpose of a WEF is to harness energy from the wind. It is important that wind turbines are sited in the optimum position to maximise the wind energy yield whilst minimising environmental impacts.

The optimum layout of a WEF depends on a range of criteria, as discussed below.

Wind turbines are used to harness the energy contained in the wind and convert this into a useable form, electricity. WEFs consume no fuel during operation and have no direct emissions as a result of electricity production. The economies of a WEF depend upon the wind resources available at a site and as such detailed information on speed, flow, direction and regularity of wind are vital when identifying locations and layouts for WEFs.

Wind turbines are mounted on a tower to elevate the generators above the ground where wind speeds are higher and the wind resource is more consistent and less turbulent. The kinetic energy of the wind is then used to turn the turbine blades, three of which are joined together to form a rotor. This movement produces mechanical power which is transmitted to the generator within the nacelle (on the top of the tower) either via gearbox or through a direct drive design of turbine. A typical wind turbine is presented in Figure 2.1, identifying the key components of a wind turbine.

The purpose of a wind energy facility is to harness energy from the wind. It is important that wind turbines are sited in the optimum position to maximise the wind yield whilst minimising environmental impacts.

The optimum layout of a wind energy facility depends on a range of criteria. These vary depending on the type and size of turbine as well as the local topography and the turbulence which may be created by surface features. Turbine manufacturers generally recommend that turbines should be spaced between three and six rotor diameters apart depending on the prevailing wind direction, turbine type and site characteristics.

Information collated at the scoping stage was used to inform the design of the WEF progressively. Good practice advises that the EIA should be an iterative process rather than a unique, post design environmental appraisal. In this way the findings of the technical environmental studies are used to inform the design of a development.

This approach will be adopted in respect of the proposed development; where potentially significant impacts are identified, efforts will be made to avoid these through evolving the design of the proposed development. This will be referred to within this EIA report as mitigation embedded in the layout and design of the proposed development, or simply 'embedded mitigation'.

Throughout the process the applicant has considered the sensitive areas as identified by specialist and adjusted the layout of the WEF accordingly. The evolution of the turbine layout is shown in the table below.

Revised Turbine Layout (98 Turbines)			Revised Turbine Layout (55 Turbines)			Revised Turbine Layout (35 Turbines)		
Turbine No.	Coordinates		Turbine No.	Coordinates		Turbine No.	Coordinates	
1	23.89766	-31.81705	1	23.89651	-31.81797	1	23.89752	-31.81716
2	23.90063	-31.81549	2	23.89955	-31.81593	2	23.90142	-31.81479
3	23.9034	-31.81371	3	23.90242	-31.81361	*Removed*		
-			4	23.90389	-31.80778	*Removed*		
4	23.90396	-31.79821	5	23.90362	-31.79792	4	23.90613	-31.79885
-			6	23.90462	-31.79275	3	23.90462	-31.79275
5	23.90755	-31.80427	7	23.90736	-31.80233	*Removed*		
6	23.9087	-31.81351	8	23.90783	-31.81553	5	23.90778	-31.81532
-			9	23.90973	-31.81217	6	23.9102	-31.81124
-			10	23.91385	-31.80711	7	23.9136	-31.80789
7	23.91613	-31.81486	11	23.91619	-31.81221	*Removed*		
8	23.91925	-31.81185	12	23.91965	-31.81	8	23.92002	-31.8096
-			13	23.92233	-31.80433	9	23.92229	-31.80428
9	23.92954	-31.80124	14	23.92922	-31.80121	10	23.9241	-31.79781
10	23.92971	-31.794	15	23.92924	-31.79362	11	23.92957	-31.79363
11	23.9315	-31.81521	16	23.93155	-31.81544	12	23.93131	-31.81548
12	23.93366	-31.78998	17	23.93244	-31.79056	13	23.93334	-31.78982
13	23.93594	-31.7818	18	23.93583	-31.78252	15	23.93591	-31.7822
14	23.93731	-31.81199	19	23.93736	-31.81198	14	23.93502	-31.81286
15	23.9364	-31.78816	20	23.93693	-31.78771	*Removed*		
-			21	23.93855	-31.80607	*Removed*		
-			22	23.94135	-31.81679	*Removed*		
-			23	23.94042	-31.7837	*Removed*		
16	23.94134	-31.7925	24	23.9418	-31.79175	16	23.94179	-31.7917
			25	23.94475	-31.81323	18	23.94455	-31.81347
17	23.94574	-31.80751	26	23.94602	-31.80751	17	23.94298	-31.8074
-			27	23.94828	-31.77964	*Removed*		
-			28	23.95185	-31.80124	19	23.95162	-31.80123
-			29	23.95109	-31.77732	*Removed*		

18	23.9561	-31.81732	30	23.95365	-31.81813	*Removed*		
-			31	23.95457	-31.77553	*Removed*		
19	23.95897	-31.81561	32	23.95699	-31.81642	20	23.95636	-31.81734
-			33	23.96194	-31.8122	21	23.9605	-31.81502
20	23.96415	-31.8275	34	23.9651	-31.82696	*Removed*		
21	23.96481	-31.81154	35	23.96622	-31.8099	22	23.96539	-31.81083
-			36	23.96725	-31.81765	*Removed*		
22	23.96855	-31.82435	37	23.96912	-31.82433	23	23.96869	-31.82475
-			38	23.97136	-31.81577	24	23.9717	-31.81746
23	23.97227	-31.82201	39	23.97323	-31.82108	*Removed*		
-			40	23.97752	-31.82582	25	23.97718	-31.82548
-			41	23.9816	-31.83077	26	23.982	-31.83076
24	23.98582	-31.83605	42	23.98562	-31.83594	27	23.98691	-31.83691
-			43	23.98619	-31.8254	*Removed*		
25	23.98923	-31.83402	44	23.98828	-31.83207	*Removed*		
26	23.9924	-31.83816	45	23.99177	-31.8379	28	23.99108	-31.82988
27	23.99311	-31.80975	46	23.99156	-31.81203	29	23.99257	-31.81016
28	23.99562	-31.82957	47	23.99425	-31.83052			
29	23.99665	-31.82329	48	23.99623	-31.82589	30	23.99352	-31.82596
-			49	23.99594	-31.80549	31	23.99529	-31.80557
30	23.99708	-31.836	50	23.99709	-31.83548	32	23.99702	-31.83449
-			51	23.998	-31.82255	33	23.99694	-31.82297
31	23.99911	-31.82042	52	23.99918	-31.81865	34	23.99926	-31.81884
32	24.00322	-31.81402	53	24.00169	-31.81579			
-			54	24.00157	-31.80956			
-			55	24.00652	-31.8122	35	24.00639	-31.81215
33	24.01408	-31.79113	*Removed*					
34	24.00234	-31.78888	*Removed*					
35	24.01359	-31.74243	*Removed*					
36	23.92247	-31.79872	*Removed*					
37	23.94388	-31.84065	*Removed*					
38	23.95229	-31.83283	*Removed*					
39	24.01711	-31.78928	*Removed*					
40	23.92213	-31.79339	*Removed*					

41	23.93827	-31.79631	*Removed*
42	24.02675	-31.78459	*Removed*
43	23.96899	-31.80021	*Removed*
44	23.89254	-31.82182	*Removed*
45	24.03814	-31.79969	*Removed*
46	23.91467	-31.81924	*Removed*
47	23.92539	-31.80906	*Removed*
48	23.89237	-31.83145	*Removed*
49	23.89802	-31.83528	*Removed*
50	23.8897	-31.8235	*Removed*
51	23.92388	-31.82716	*Removed*
52	23.94342	-31.81096	*Removed*
53	24.03264	-31.75694	*Removed*
54	24.03117	-31.78224	*Removed*
55	23.93409	-31.79801	*Removed*
56	23.97758	-31.81272	*Removed*
57	23.90527	-31.83721	*Removed*
58	23.99131	-31.7877	*Removed*
59	24.03527	-31.75499	*Removed*
60	23.94073	-31.8434	*Removed*
61	23.94934	-31.79776	*Removed*
62	23.91107	-31.82201	*Removed*
63	23.92232	-31.81048	*Removed*
64	23.89796	-31.83929	*Removed*
65	24.03501	-31.80155	*Removed*
66	23.9728	-31.79774	*Removed*
67	23.89437	-31.80465	*Removed*
68	24.01226	-31.75339	*Removed*
69	23.99261	-31.83129	*Removed*
70	23.9383	-31.82035	*Removed*
71	23.97473	-31.77149	*Removed*
72	23.89154	-31.81745	*Removed*
73	23.98405	-31.78318	*Removed*
74	24.0195	-31.74883	*Removed*

75	23.90284	-31.78821	*Removed*
76	23.99657	-31.78766	*Removed*
77	23.94809	-31.78237	*Removed*
78	23.92427	-31.79085	*Removed*
79	24.00498	-31.77028	*Removed*
80	23.90365	-31.83146	*Removed*
81	23.92945	-31.78783	*Removed*
82	23.95652	-31.83106	*Removed*
83	23.93434	-31.81351	*Removed*
84	23.98155	-31.81841	*Removed*
85	23.90087	-31.8336	*Removed*
86	23.99572	-31.79334	*Removed*
87	24.02816	-31.74744	*Removed*
88	23.99936	-31.77548	*Removed*
89	23.98078	-31.80555	*Removed*
90	24.03668	-31.7853	*Removed*
91	24.02933	-31.79849	*Removed*
92	24.02293	-31.78691	*Removed*
93	23.93646	-31.84534	*Removed*
94	24.01841	-31.74282	*Removed*
95	23.94898	-31.83491	*Removed*
96	23.91861	-31.82868	*Removed*
97	23.89985	-31.82583	*Removed*
98	24.01936	-31.75527	*Removed*

6.3.1 *Technology Alternatives*

Other renewable energy technologies include hydro-electric power, photo voltaic solar or concentrated solar power. The site has no capacity for hydro-electricity as there are no dams on site nor can any dams be built. The site topography is less suited to the construction of large scale ground mounted solar facility. Solar electricity generation would also require a much greater land footprint to generate the equivalent energy of the proposed WEF. Wind energy is likely to present less of an impact on the continued use of the land for grazing as it does not result in the shading that occurs from solar facilities which may affect vegetation levels and consequently farming practices. Whilst there are potential impacts associated with wind energy which are not associated with solar, such as collision risk with avifauna, there are different potential impacts for solar facilities such as loss of habitat and foraging areas for avifauna and other ecological receptors. Based on the sites physical characteristics and existing land use, the renewable energy technology best suited to the site, taking into account the potential environmental impacts is a wind energy facility, however the specific design of the WEF at the site should be informed by the EIA process as outlined below.

Various wind turbine designs and layouts will be considered for the site in order to maximise the electricity generating capacity and efficiency. The turbine manufacturer and turbine model has not yet been determined and will not be decided until the completion of further wind analysis and competitive tendering.

Based on the assessment of alternatives, it was determined that the current proposed location of the WEF would be most suitable for the project, located in the Western and Northern Cape Provinces. Through the scoping process, the EIA i and the additional bird and bat monitoring, the design of the WEF has been assessed, taking into consideration environmental constraints. These constraints were provided by the specialists, and included, no-go areas based on avifaunal, bat and visual constraints, as well as floral and faunal constraints. A provisional layout for the proposed development was designed based on these constraints, and provided to the specialists to use as part of the impact assessment phase. Due to the nature of the process, this provisional layout has evolved throughout the process.

This layout will be submitted to the DEA, and if approved and awarded preferred bidder status, this layout will further be developed, through micro siting of turbines and roads, with the assistance from the relevant specialists. For the purposes of the impact assessment and the initial layout it was assumed that the GW 109 turbine would be used for the proposed development. During the EIA process (and the constraints identified during it) and as new technology became available, it is proposed that for this 35 turbine layout the Vestas150 turbine is used.

7 THE PROPOSED PROJECT

The proposed project which this section of the report focuses on is the Umsinde Emoyeni WEF Phase 2.

The proposed project Phase 2 will comprise no more than 35 wind turbines, with a total installed capacity of 147 MW. Turbines with a maximum height to tip of blade of 210 m will be considered (hub height of 135 m, rotor diameter up to 150 m) (Figure 1.4). The proposed project will be located on the north east portion of the WEF site boundary (Figure 1.3)

The WEF Phase 1 will have a contracted capacity of up to 140 MW, and an installed capacity of up to 147 MW in line with the REIPPPP.

The WEF Phase 2 will have a contracted capacity of up to 140 MW, and an installed capacity of up to 147 MW in line with the REIPPPP.

An application form for the proposed development was submitted to the DEA in April 2014, the DEA accepted the application form, and issued this proposed development with the following reference number 14/12/16/3/3/2/687.

The location of the turbines is presented in Figure 9.10. The proposed locations were identified based on the constraints and sensitivity mapping conducted during the scoping phase, the EIA phase, and updated specialist assessments. This allowed placement of turbines, in areas of moderate to low sensitivity. The road and turbine layout was used by the specialists to inform their impact assessment reports and significance rating. Through the EIA phase recommendations from each specialist was made on the proposed layout of the turbines, including the movement of turbines away from sensitive areas and buffered areas. Due to the small distances of these movements, this will be done by the developer during the final design phase and during micro siting of the turbine. This layout will be submitted to the DEA, as the final development layout, for approval prior to the start of construction.

The grid site boundary connects the WEF with the Eskom Gamma substation. It should be noted that this is the same study area proposed for the grid infrastructure associated with the proposed Ishwati Emoyeni WEF (authorised by DEA). If the adjacent Ishwati Emoyeni WEF is awarded preferred bidder and constructed in advance of Umsinde Emoyeni, the preferred point of the grid connection may be on the Ishwati Emoyeni site (not at the Gamma substation). This would reduce the length of the power lines required to connect Umsinde Emoyeni to the national grid. The proposed grid connection is assessed under a separate application (DEA Reference 14/12/16/3/3/2/685).

If awarded Preferred Bidder Status, the EWFP would enter into an implementation agreement with the DoE and a Power Purchase Agreement (PPA) with the buyer of the energy, which in this case is Eskom. Once operational the electricity would be sold to Eskom under the PPA at the agreed bid price (tariff). Eskom then distribute the energy through the national grid to the energy users.

7.1 Proposed Project Components

The proposed project will comprise the following components as described below. It should be noted as the final design of the proposed project is not yet finalised, all dimensions are maximums as is required by the EIA process. The final design may include infrastructure which is of equal or less than dimensions to those stated below but not more than.

7.1.1 Turbines

The proposed project will consist of up to a maximum 35 turbines, which is the worst case scenario for the project. Each turbine will have a maximum height to blade tip of 210 m. The turbines will be three-bladed horizontal-axis design with a hub height of up to 135 m and a rotor diameter of up to 150 m. A typical wind turbine is presented below. The exact turbine model has not been selected yet and will be subject to competitive tendering after further wind and financial analysis has been completed. The turbine model will depend upon the technical, commercial and site specific requirements.

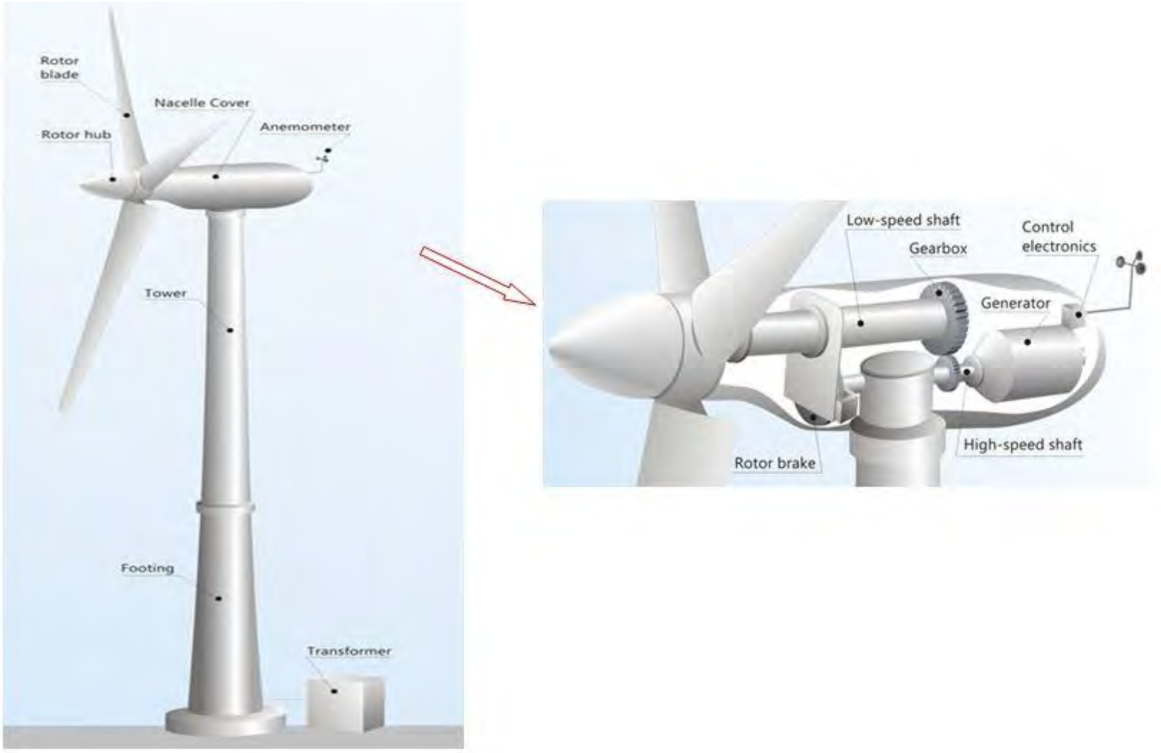


Plate 6 Typical Components of a Wind Turbine

The turbine rotor speed will vary according to the energy available in the wind, the wind speed. The turbines will generate power in wind speeds between approximately 3 metres per second (m/s) and 28 m/s (depending on the model of turbine) with maximum power output usually achieved at wind speeds of around 10 – 12 m/s. At average wind speeds greater than approximately 28 m/s the turbines would will automatically turn the angle of the blade to reduce energy capture (this is known as 'pitching') and stop turning to prevent damage.

Each turbine will require a transformer and, depending on the selected model of turbine, this will be either located within the turbine tower or adjacent to the turbine on a concrete plinth.

The turbines will be placed on steel and concrete foundations which will each occupy an area of up to 30 m by 30 m in total[14] (which includes the maximum total area that may need to be disturbed during construction of the foundation), and be typically up to 3 m deep and may include concrete and steel plinths depending upon local ground conditions.

Once construction is complete, much of the foundation area can be rehabilitated.

7.1.2 Hardstanding Areas

A hardstanding area of up to 45 m by 25 m will be established adjacent to each turbine location. This will be used to provide a platform for cranes to operate during construction (and unscheduled maintenance), as well as a clear area to lay out turbine components prior to erection.

[14] Note this includes an increase in the 20 m by 20 m stated on the application forms submitted in April 2014. The 20 m by 20 m is the approximate area of the turbines foundation, however an area of up to 30 m by 30 m will need to be cleared for the installation of the turbines base, as such for the EIA we will be assessing a worst case scenario of 30 m by 30 m. Whilst this is an amendment to the application form it does not alter the Listed Activities applied for and will be assessed as the worst case at the EIA stage.

7.1.3 Laydown Areas

Up to three additional temporary laydown areas of up to 150 m by 60 m in size will be required for equipment and component storage during construction. These areas will be levelled and compacted and used for component storage.

7.1.4 Electrical Cabling and Onsite Substation

The electricity from the turbines will be transferred via a 33 kV electrical network to a 33 / 132 kV onsite substation (Figure 7.1). Where feasible and possible this will be underground. The on-site substation will house electrical infrastructure such as transformers and switch gear to enable the energy to be transferred into the existing national grid. At this stage it is not clear which components of the on-site substation, will be transferred to ESKOM, as part of the grid connection, and transmission and distribution, therefore the substation is included in all four applications and assessed in all four impact assessments. Typical example of a substation is shown below (Plate 5).

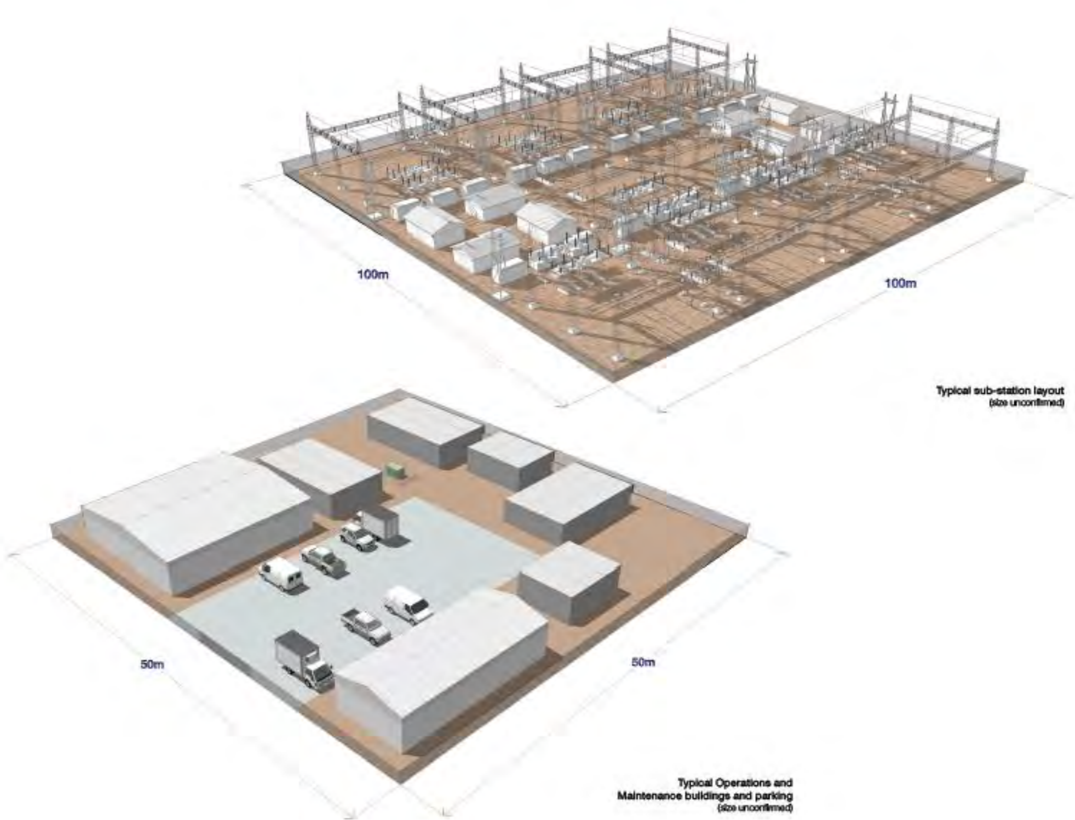


Plate 5 Typical Substation Layout

7.1.5 Access

The turbine locations will be accessed through a network of unsealed tracks which will be established across the project site (Figure 7.1). These access tracks will be up to 9 m wide during construction, depending on local topography, but will be reduced to between 4 m and 6 m during operation. Such roads are required to facilitate access for the cranes and abnormal load deliveries of turbine components.

Existing farm access tracks will be upgraded and utilised where possible, as will existing watercourse crossings (see Figure 7.1 for potential water crossings). No borrow pits will be established on site. All material required for the construction of the proposed project will be imported to site.

7.1.6 Compound

There will also be an on-site office compound, including site offices, parking and an operation and maintenance facility including a control room.

7.1.7 Ancillary Equipment

In addition to the key components outlined above, the WEF will also require:

- Anemometer masts;
- Security fencing; and
- CCTV monitoring towers.

7.2 Description of Construction Phase

It is estimated that construction will take approximately 18 - 24 months subject to the final design, weather and ground conditions, including time for testing and commissioning. The construction process will consist of the following principal activities:

- Site survey and preparation;
- Construction of site entrance, access tracks and passing places;
- Enabling works to sections of the public highway within the WEF Site (if required) to facilitate turbine delivery;
- Construction of the contractors' compound;
- Construction of the crane pads;
- Construction of the turbine foundations;
- Construction of the substation building;
- Excavation of the cable trenches and cable laying;
- Delivery and erection of wind turbines;
- Erection of electricity distribution line;
- Testing and commissioning of the wind turbines; and
- Site restoration.

Some of these operations will be carried out concurrently, although predominantly in the order identified, in order to minimise the overall length of the construction programme. Construction will be phased such that the civil engineering works will be continuing in some parts of the site whilst wind turbines are being erected elsewhere. Site restoration will be programmed and carried out to allow restoration of disturbed areas as early as possible and in a progressive manner.

7.2.1 Construction Phase Employment

Based on experience from other WEFs the construction phase is likely to create approximately 300 employment opportunities. Of this total, approximately 25 % will be available to skilled personnel (engineers, technicians, management and supervisory), 15 % to semi-skilled personnel (drivers, equipment operators) and 60 % to low skilled personnel (construction labourers, security staff). The number and nature of employment opportunities will be refined as the development process progresses.

7.3 Description of Operational Phase

The proposed project will be designed to have an operational life of between 20 and 25 years. Currently, preferred bidders in the REIPPPP are awarded Power Producer Agreement (PPA) for 20 years. During operation of the WEF, the large majority of the development site will continue in agricultural use as it is currently. The only project related activities on-site will be routine servicing and unscheduled maintenance, as detailed in the following sections.

7.3.1 Operational Phase Employment

Based on experience from other WEFs the operational phase is likely to create approximately 75 permanent employment opportunities. Of this total approximately 80 % (60) will be low and medium-skilled and 20 % (15) will be high skilled positions. The number and nature of employment opportunities will be refined as the development process progresses.

7.3.2 Routine Servicing

Wind turbine operations will be overseen by suitably qualified local contractors who will visit the site regularly to carry out maintenance. The following turbine maintenance will be carried out along with any other maintenance required by the manufacturer's specifications:

- Initial service;
- Routine maintenance and servicing;
- Gearbox oil changes; and
- Blade inspections.

Routine scheduled servicing will likely take place twice per year with a main service likely to occur at twelve-monthly intervals. Servicing will include the performance of tasks such as maintaining bolts to the required torque, adjustment of blades, inspection of blade tip brakes and inspection of welds in the tower. In addition, oil sampling and testing from the main gearbox will be required and oil and other consumables replaced at regular intervals. Other visits to the site will take place approximately once per week to ensure that the turbines are operating at their maximum efficiency.

Site tracks will be maintained in good order. Safe access will be maintained all year round.

The turbines are monitored 24 hours a day real-time via a supervisory control and data acquisition (SCADA) system.

7.3.3 Unscheduled Maintenance

Unscheduled maintenance associated with unforeseen events will be dealt with on an individual basis. In the unlikely event of a main component failure cranes may be mobilised to site to carry out repairs and/or replacement works.

7.4 Description of Decommissioning Phase

At the end of the operation phase, the proposed project may be decommissioned, or may be repowered i.e. redesigned and refitted so as to operate for a longer period. Repowering would not be undertaken under this application or resulting Environmental Authorization, and would be subject to a new application at the time. In the event of decommissioning, typically, all above ground equipment will be dismantled and removed from the site. Cables and the turbine foundations will be cut off below ground level and covered with topsoil. Access tracks will be left for use by the landowners, or if appropriate, covered with topsoil or reduced in width.

This approach is considered to be best practice environmentally and less damaging than seeking to remove all foundations, underground cables in their entirety. Decommissioning will take account of the environmental legislation and technology available at the time of decommissioning.

7.5 Grid Connection Associated with the WEF

The electricity generated from the WEF will need to be transferred from the on-site substation to the existing national grid.

Eskom has an existing grid network in the area and it is proposed that the electricity will be transferred to the existing Eskom Gamma substation via a system of 132 kV overhead power lines. The grid connection associated with this proposed project (Umsinde Emoyeni WEF Phase 2) is subject to a separate environmental authorisation process, DEA REF: 14/12/16/3/3/2/685 Umsinde Emoyeni Electrical Grid Connection Phase 2.

8 DESCRIPTION OF THE BASELINE ENVIRONMENT

This section of the EIAR provides the description of the baseline environment of the proposed development (within which the proposed project lies). The desktop research of the baseline environment was presented in the Scoping Report (Arcus, 2014). This section highlights the significant findings of the site visits undertaken during the EIA phase of the process. Additional Information on the baseline is included in Section 11 of this report, where, additional site visits were undertaken by the bird and bat specialist, and updated desktop information has been included for the other specialist's studies. .

8.1 GEOLOGY, SOILS AND AGRICULTURE

The site (Figure 8.1) falls predominantly into the Fc131 and Da147 land types with the Fb488, Fc402, Ia94, Ib126, Ib262 and Ib397 land types having a limited occurrence (Land Type Survey Staff, 1972 -2006). Below follows a brief description of the land types in terms of soils, land capability, land use and agricultural potential.

Land Type Da147

Land Type: Da land types denote areas where duplex soils with red B horizons dominate.

Soils: Mainly variable depth duplex soils throughout the landscape with hills being dominated by rocky soils and rock outcrops.

Land capability and land use: Land use is limited to extensive sheep grazing with small occurrences of crop production in alluvial deposits in drainage features. The land capability mimics the land use.

Agricultural potential: The agricultural potential is linked to the soil depth and the bulk of the land type is therefore of low crop production potential (land capability classes VII and VIII). The soils are suited to extensive grazing only due the low and erratic rainfall (around 300 mm per year). Irrigated crop production is possible where adequate water resources are available but these land uses require very intensive management in duplex soil environments.

Land Type Fc131

Land Type: Fb and Fc land types denote areas that are dominated by pedologically young landscapes with lithocutanic B horizons. Fb land types accommodate areas with lime in bottomland positions and Fc land types areas with lime in all landscape positions.

Soils: Mainly shallow and rocky soils in upland and mid-slope positions with a variety of structured to apedal soils of moderate to shallow depth in foot slope and valley bottom positions – most containing lime. Duplex and pedologically young soils dominate in these positions with the exception of dolerite outcrops where more stable structured soils occur.

Land capability and land use: Land use is limited to extensive sheep grazing with small occurrences of crop production in alluvial deposits in drainage features. The land capability mimics the land use.

Agricultural potential: The agricultural potential is linked to the soil depth and the bulk of the land type is therefore of low to very low crop production potential (land capability classes VII and VIII). The soils are suited to extensive grazing only due to the low and erratic rainfall (around 300 mm per year).

Land Type Fc402

The Fc402 land type is similar to the Fc131 land type with the difference that structured soils dominate throughout.

Land Type Ia94

Soils: Mainly pedologically young soils derived from alluvium in foot slope and valley bottom positions. Lime occurs throughout.

Land capability and land use: Land use ranges from grazing through dryland agriculture to irrigated agriculture.

Agricultural potential: The agricultural potential is linked to the soil depth and large areas are of high potential in the presence of water. In the absence of irrigation water the potential is low and then limited to extensive grazing. Dryland crop production is not possible as the rainfall is in the region of 300 mm per year.

Land Types Ib126, Ib262 and Ib397

Soils: Almost exclusively shallow and rocky soils with rock outcrops due to undulating and hilly topography. A range of soils occur to a limited extent in depressions and flatter areas.

Land capability and land use: Land use is limited to extensive grazing.

Agricultural potential: The agricultural potential is very low and limited to extensive grazing sheep production (land capability classes VII and VIII). This is due to the shallow and rocky soils as well as the low rainfall.

The land uses as identified during the previous phase were confirmed during the site visit and survey. The reconnaissance soil survey confirmed the land type data that indicates the entire site to be dominated by shallow and rocky soils as well as extensive rock outcrops. The only areas of significant soil profile development are drainage depressions where eroded soil material accumulates. These areas are also prone to severe erosion.

All the turbine positions are on rocky soil areas in the higher lying parts of the landscape, situated on rocky outcrops. The position of turbines are outside of drainage depressions and therefore areas with deeper and sensitive soils.

The agricultural potential of the site is directly linked to the soils. The shallow and rocky soils are of **very low** potential and the deeper sandy soils are of **medium** potential. The latter soils are very sensitive to erosion and due to the rainfall in the area these are only suited to extensive grazing. In very limited areas the deeper drainage depression soils could be suitable for irrigation purposes.

8.2 FLORA

8.2.1 Broad Scale Vegetation Types

According to the national vegetation map (Mucina & Rutherford 2006), only three different vegetation types occur within the study area, Upper Karoo Hardeveld, Eastern Upper Karoo and Southern Karoo Riviere (Figure 8.2). The site is dominated by Eastern Upper Karoo, which at 49 821 km^2 is the most extensive vegetation type in South Africa and forms a large proportion of the central and eastern Nama Karoo Biome. This vegetation type is classified as Least Threatened, and about 2 % of the original extent has been transformed largely for intensive agriculture. The vegetation type is however poorly protected and less than 1 % of the 21 % target has been formally conserved.

Mucina & Rutherford (2006) list eight endemic species for this vegetation type, which considering that it is the most extensive unit in the country, is not very high. Dominant species within the study area include *Pentzia incana, Rosenia humilis, Pteronia sordida, Zygophyllum lichtensteinii, Eriocephalus ericoides, Salsola calluna, Osteospermum leptolobum* and *Ruschia intricata* with a variable grass layer often including *Fingerhuthia* *africana, Eragrostis bergiana, Tragus koeleroides* and *Eragrostis lehmanniana*. There may be occasional areas of deeper sands present, usually of aeolian nature, blown up against hills which are dominated by grass species such as *Stipagrostis ciliata, S.obtusa* and *Eragrostis lehmanniana* with occasional scattered shrubs such as *Lycium cinereum, Gnidia polycephala, Rosenia oppositifolia* and *Melolobium candicans.*

The Upper Karoo Hardeveld vegetation type is associated with 11 734 km^2 of the steep slopes of koppies, butts mesas and parts of the Great Escarpment covered with large boulders and stones. The vegetation type occurs as discrete areas associated with slopes and ridges from Middelpos in the west and Strydenburg, Richmond and Nieu-Bethesda in the east, as well as most south-facing slopes and crests of the Great Escarpment between Teekloofpas and eastwards to Graaff-Reinet. Altitude varies from 1000 – 1900 m. Mucina & Rutherford (2006) list 17 species known to be endemic to the vegetation type. This is a high number given the wide distribution of most Nama karoo species and illustrates the relative sensitivity of this vegetation type compared to the surrounding Eastern Upper Karoo. Typical and dominant species characteristic of these areas includes grasses such as *Themeda triandra, Heteropogon contortus, Enneapogon scaber, Digitaria eriantha, Erogrostis lehmanniana* and *Aristida diffusa subsp. burkei;* shrubs such as *Felicia filifolia, Pentzia globosa, Hermannia filifolia, H.munitiflora, Melolobium candicans, Nenax microphylla, Eriocephalus ericoides, Asparagus suaveolens and Chrysocoma ciliata* and low trees and large shrubs such as *Searsia burchellii, Ehretia rigida* and *Lycium oxycarpum, Cadaba aphylla, Melianthus comosus* and *Buddleja glomerata*.

The Southern Karoo Riviere vegetation type is associated with the rivers of the Central Karoo such as the Buffels, Bloed, Dwyka, Gamka, Sout, Kariega and Sundays Rivers. About 12 % has been transformed as a result of intensive agriculture and the construction of dams. Although it is classified as Least-threatened, it is associated with rivers and drainage lines and those areas classified under this vegetation type should be considered sensitive. Within the site, dominant and typical species within this vegetation type includes *Acacia karoo* which is usually dominant along the larger water courses, as well as *Olea europea subsp*. *africana, Searsia lancea* and *Diospyros lycioides*. On the open plains large woody species are less conspicuous the systems often anastomise with extensive alluvial floodplains dominated by species such as *Salsola aphylla, Salsola rabieana* and *Atriplex vestita var. appendiculata, Aridaria noctiflora subsp straminea, Drosanthemum lique* and *Lycium cinereum*.

Compared to the other vegetation types, this is the only vegetation type at the site which contains a significant amount of trees. The other vegetation types at the site are dominated by low shrubs and grasses with occasional larger shrubs. The extent of this vegetation type is not well mapped and is much more extensive along the larger drainage systems of the site than has been mapped. This vegetation type is present all along the Buffels, Bakensklip and other large drainage lines of the site. These areas are also ecologically important because they function as ecological corridors for the movement of fauna about the landscape and also represent key resource areas for many fauna.

8.2.2 Habitat Types

The vegetation of the site, is relatively homogenous at a broad scale, but is repetitively patterned within the site at a fairly fine scale, related primarily to soil texture, depth and landscape position. Within the Umsinde Emoyeni site, the main driver of vegetation composition is elevation. Elevation is a key driver of vegetation pattern as it has a dominant influence on rainfall as well as on temperature. There are some areas of dolerite outcrops at the site associated with the Upper Karoo Hardeveld vegetation type and these areas contain significantly greater plant and animal species richness than the surrounding areas on shale-derived soils.

The landscape diversity and rugged topography of the area is reflected in the map, which illustrates the varied nature of the site with hills, drainage features and more flat areas repeatedly interspersed across the site. The majority of turbines are located on the flatter open plains of the site, which is considered the least sensitive habitat. However, there are also a number of turbines located on steeper slopes especially within dolerite outcrops and within the plains wash habitat. On the steeper slopes, access roads and turbines will generate a significant erosion risk and there are also sensitive features present in these areas including localised habitats such as rock fields and densely-vegetated south-facing slopes. The dolerite outcrops are considered sensitive as these habitats contain high diversity of fauna and flora compared to the adjacent areas and are considered vulnerable to human impact and disturbance.

The washes of the site are sometimes very broad and difficult to avoid and in many cases, these are anthropogenic features resulting from the loss of vegetation cover due to livestock grazing and concomitant increase in runoff and development of incipient erosion. These areas are vulnerable to disturbance and specific precautions will need to be taken in these areas to ensure that the development does not trigger or exacerbate erosion problems in these areas. The proper regulation of runoff and water flow is a key factor in these areas and mitigation should aim to slow the flow of water and thereby reduce it energy and erosion potential as much as possible.

Within the higher-lying areas, there are some rock fields present which also contain succulent and geophyte species not found elsewhere at the site. Many of these are small and would only be located during a walk-through of the facility, should either phase become a preferred bidder under the REIPPP.

8.2.3 Plant Species of Conservation Concern

In terms of the presence of species of conservation concern within the site, the abundance of such species is fairly low. According to the SIBIS database, only five such species are known from the area. However an additional species *Gethyllis longistyla* which is classified as Rare was observed in a rockfield near one of the wind measuring masts near the eastern margin of the site. The other listed species are not likely to impose a significant constraint on the development as several are associated with mesic areas such as vleis and, as these areas are intrinsically sensitive, such areas would need to be avoided in any case. Some other listed species are relatively widespread species whose local populations are not likely to be compromised by the relatively low footprint of the wind farm. It is, however, likely that additional listed species occur at the site as it has not been well sampled in the past.

8.3 FAUNA

8.3.1 Mammals

The site falls within the distribution range of approximately 53 terrestrial mammals, indicating that the mammalian diversity at the site is potentially high. The site is extensive and topographically diverse, suggesting that a large proportion of these species are likely to occur at the site. Species observed during the site visit to Umsinde Emoyeni or to the adjacent Ishwati Emoyeni site include Greater Kudu *Tragelaphus strepsiceros*, Aardvark *Orycteropus afer*, Rock Hyrax *Procavia capensis*, Springbok *Antidorcas marsupialis*, Steenbok *Raphicerus campestris*, Cape Hare *Lepus capensis*, South African Ground Squirrel *Xerus inauris*, Yellow Mongoose *Cynictis penicillata*, Bat-eared Fox *Otocyon megalotis*, Namaqua Rock Mouse *Aethomys namaquensis*, Bush Vlei Rat *Otomys unisulcatus* and Cape Porcupine *Hystrix africaeaustralis*. Three listed species potentially occur at the site, the Black-footed Cat *Felis nigripes* (Vulnerable), Leopard *Panthera pardus* (Near-threatened) and Honey Badger *Mellivora capensis* (SARDB Endangered).

In terms of the listed mammals, it is possible that there are Leopard in the area given the rugged topography of the site, while the Black-footed Cat and Honey Badger probably also occur at the site at a low density as is typical for these species within arid environments. Although some impact on these species may occur as a result of development in the area, they are widespread species and this would not be likely to compromise the local or regional populations of these species. It is not considered likely that the Riverine Rabbit *Bunolagus monticularis* occurs at the site. This species is associated with silty floodplains and if it were to occur anywhere at the site, it would be on the lowland floodplains of the major rivers. As these areas would be avoided by the development, the possibility of impact on this species can be discounted.

8.3.2 Reptiles

According to the SARCA database, 23 reptiles have been recorded from the half degree squares 3123D and 3124C, but this rises to 50 species when the area of interest is expanded to the whole of 3123 and 3124. The latter is a much bigger area than the study site and probably includes a variety of habitats that are not present within the study area, but sampling density across the Karoo is generally very low and so a conservative approach is necessary to ensure that all potential species present at the site are captured. However, even within the larger dataset, there are few listed reptiles that are likely to be present at the site.

The only listed species known from the area according to the SARCA database is the Karoo Padloper, *Homopus boulengeri*, which is a Karoo endemic restricted to the Nama Karoo in the Eastern, Western and Northern Cape. The distribution of this species is however fairly large and the site is not within an area of known significance for this species which appears to favour lowland habitats over mountainous terrain.

It is possible that the Plain Mountain Adder *Bitis inornata* occurs within the high-lying parts of the site, above 1600 m. This little-known species is found in the Sneeuberge and may occur at the site as well. It is currently listed as Endangered and has apparently declined significantly in recent times. Although it has not been recorded from the site, the area has not been well investigated and there is a reasonable probability that it occurs at the site. Although the presence of this species would not constitute a fatal flaw, it nevertheless highlights that areas above 1600 m may have additional high-elevation species present and should be considered higher sensitivity as a result.

8.3.3 Amphibians

Amphibian diversity in the study area is low, with only 11 species known from the area. This is however not surprising given the aridity of the area and low abundance of favourable amphibian habitats. Clearly the larger river systems, the Buffels and Bakensklip would be the most important areas for amphibians as these rivers contain permanent pools which would be home to species such as Platanna, Cape River Frog and Clicking Stream Frog. The smaller drainage lines and ephemeral pans are likely to be used by less water-dependent species such as Common Caco and Karoo Toad. The only listed species known from the area is the Giant Bullfrog, *Pyxicephalus adspersus* which is associated with ephemeral pans and is not likely to be common in the area and is only sporadically encountered in the Karoo.

8.3.4 Critical Biodiversity Areas

The site falls within the planning domain of the Critical Biodiversity Areas map for the Central Karoo District Municipality. Figure 8.3 indicates the CBA status of the area, as well as the underlying reasons that certain areas were designated as CBA or ESA. In many areas there may however be several reasons that an area is a CBA or ESA and so it is not possible to illustrate all the possible combinations, but the dominant or most relevant reason has been illustrated.

A large proportion of the southern part of the site is CBA, while a large part of the eastern section of the site is an ESA, based on the site falling within an area classified as part of a priority catchment identified under the NFEPA. Although Phase 1 is in close proximity to the CBA, it largely avoids the CBAs but under the current layout 57 turbines are located within the Ecological Support Area. In terms of Phase 2, 64 turbines are within the ESA and a small extent of new access road is within a CBA. Therefore, the overall direct impact of the development on CBAs is low, but the potential impact on the ESA is relatively high as the majority of the development footprint is located within the ESA.

8.4 WETLANDS AND FRESHWATER

The study site is located approximately 35 km north west of the Murraysburg, with the WEF site falling within three quaternary catchments of the Gamtoos Water Management area (Quaternary catchments, L21C, L21D & L21E) (Figure 8.4). Several main stem rivers are found within these catchments which form part of the Brak River. These tributaries include:

- Skietkuilspruit;
- Brak River;
- Snynderskraal River;
- Buffels River; and
- Several unknown tributaries.

The proposed development from an aquatic vegetation point of view is dominated by species associated with the Nama Karoo vegetation ecosystem. These systems are thus usually devoid of any trees with strict riparian or wetland affiliations and this is due to the largely ephemeral nature of the rivers / water courses within the region. However the larger systems, such as those listed above have a higher mean annual run-off and thus contain a woody layer component within the riparian floodplain areas which are dominated by *Acacia karroo*, *Searsia lanceolata* and *Combretum* species.

Several water bodies and aquatic systems are indicated in Figure 8.5 and 8.6. Based on the 6 levels of the National Wetland Classification System, these systems are typical of Inland Systems (Level 1), within the Drought Corridor Ecoregion (Level 2).

Wetland landscape units (Level 3) were thus valley floors (riparian / palustrine) or un-channelled valley bottom hydrogeomorphic units (Level 4). Several of these have been indicated in the National Wetland Inventory, however upon closer inspection during the site visit (Plate 6), and the National Freshwater Priority Ecosystems Areas (NFEPA) database (Nel *et al*. 2011) most of the indicated wetlands are man-made systems.

Within the remaining waterbodies, the low annual rainfall within the region the water courses infrequently contain any surface runoff or open water (Level 5), but would remain important habitat or refugia within a landscape when flowing or inundated. These were thus classified as riverine drainage lines, alluvial river beds and small to medium sized water courses. The majority of the water course crossings will occur on the smaller drainage lines and water courses and will not impact on the large alluvial systems.

Plate 6 Small borrow pit area associated with past road works that was identified as a natural wetland by NFEPA (Nel et al. 2011) and was classified as an artificial or man-made dam in this study

8.4.1 The Present Ecological State (PES) of the Rivers

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

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

Table 2 The Present Ecological State scores (PES) for the drainage lines and the rivers in the study area were rated as follows (DWS, 2014 – where C = Moderately Modified & B = Largely Modified)

Subquaternary Catchment Number	Present Ecological State	Ecological Importance	Ecological Sensitivity
6621	C	Moderate	Moderate
6748	D	Moderate	Moderate
6756	C	Moderate	Moderate
6810	C	High	Moderate

It is thus evident that the study area systems are largely functional, however significant impacts as a result of current land use practices and alien trees (e.g. *Salix babylonica*) do occur. This was confirmed for each of the affected reaches located within the development footprint and in particular the areas that would be crossed by the proposed road layout shown in Figure 1.3. In other words, the systems observed are natural, with small or narrow riparian zones, dominated by *Searsia lancea* and *Vachellia karroo.* The only obligate species observed include small areas of *Juncus rigidus* and *Phragmites australis* associated with small pools created by road culverts found throughout the study area.

The present day impacts have affected the Ecological Importance (EI) and Ecological Sensitivity (ES) of these systems, with most being rated as Moderate (EI & ES).

The only exception being Sub-Quaternary Catchment, 6810 (L21D), where EI was rated as High. This was due to the importance of this catchment in being a Fish Corridor and containing downstream habitat for the various listed fish species, i.e. high scores for fish rarity metrics for this catchment.

8.5 AVIFAUNA

8.5.1 Desktop Assessment

8.5.1.1 SABAP 1 AND SABAP 2

The South African Bird Atlas Project 1 (SABAP 1) data was collected over an 11 year period between 1986 and 1997 and remains the best long term data set on bird distribution and abundance available in South Africa at present. These data were collected in quarter degree squares, with the WEF site covering the following squares: 3123DB, 3123DD, 3124CA and 3124CC. Within these squares, the total number of all species recorded varied from 91 to 171. Square 3123DD covered the majority of the WEF site, and also had the highest number of cards submitted and the most records of priority species. Overall, the SABAP1 project recorded a total of 194 species including 28 priority species and 17 red data species as well as 24 endemic or near-endemic species[15] for the area.

White Stork is afforded protection internationally under the Bonn Convention on Migratory Species and was recorded in square 3124CA. Report rates are essentially percentages of the number of times a species was recorded in the square, divided by the number of times that square was counted (i.e. the number of cards submitted). It is important to note that these species may have been recorded anywhere within in the entire quarter degree square in each case and may not necessarily have been recorded on the proposed WEF site.

SABAP 2 is part of an ongoing study by the Animal Demography Unit at the University of Cape Town. SABAP2 data were examined for surveyed pentads in the study area. Pentads are roughly 8 km x 8 km squares, and smaller than the squares used in SABAP1. The following pentads were examined: 3155_2350; 3150_2350; 3145_2345; 3140_2350; 3140_2400; 3145_2400; 3150_2400; 3155_2400; and 3155_2355. A total of 176 species were recorded, including 22 priority species, 11 red data species and 22 endemic or near-endemic species. SABAP2 recorded 15 species that were not recorded by SABAP1; including Southern Black Korhaan (a priority species) that had been split from the Black Korhaan since the SABAP1 project. Both Northern and Southern Black Korhaan have been recorded in the area by SABAP2.

8.5.1.2 Coordinated Waterbird Count (CWAC)

Coordinated Waterbird Counts are conducted at least six-monthly since 1992 on over 400 wetlands in South Africa organised by the Animal Demography Unit. These counts therefore

[15] Endemic or near endemic (i.e. ~70% or more of population in RSA) to South Africa (not southern Africa as in field guides) or endemic to South Africa, Lesotho and Swaziland. Taken from BirdLife South Africa Checklist of Birds in South Africa, 2014.

provide a good indication of the potential occurrence of waterbirds in an area. The nearest CWAC site is Nqweba Dam which is located approximately 49 km to the south east of the WEF site, near Graaff-Reinet. This dam is counted regularly and 19 cards have been submitted with 59 species identified of which six were priority species. Twelve species were recorded during CWAC counts that were not recorded by SABAP1 or SABAP2, including two regional red data species, Maccoa Duck (*Near-threatened*) and Caspian Tern (*Vulnerable*) as well as Marsh Owl, a priority species.

Twenty cards have been submitted for Kriegerspoort Dam, which is located approximately 70 km to the north east of the WEF site, 34 species were recorded. The numbers of individuals recorded is not publically available. Of these species, three were priority species including a regional red data species, Pink-backed Pelican (*Vulnerable*) which was not recorded by SABAP1 or SABAP2 data considered above for the WEF site. It is considered highly unlikely that this species would utilise or pass through the WEF site.

Both CWAC dams are located in Important Bird Areas: Nqweba Dam is located within the Karoo Nature Reserve (IBA code: SA090) and Kriegerspoort Dam is located within the Platberg-Karoo conservancy (IBA code: SA037).

8.5.1.3 Important Bird Area project (IBA)

Two IBAs are located within 50 km of the WEF site: the Karoo Nature Reserve (IBA code: SA090) and the Platberg-Karoo conservancy (IBA code: SA037).

8.5.1.4 Karoo Nature Reserve

The Birds in Reserves Project of the Animal Demography Unit has recorded 175 species within this IBA. 18 priority species were recorded of which three were not captured by SABAP2, namely Lanner Falcon, Lesser Kestrel and Denham's Bustard.

8.5.1.5 Platberg-Karoo Conservancy

This IBA holds important populations of two globally threatened species, the Lesser Kestrel and the Blue Crane. The Karoo population of Blue Crane is the only strong population remaining on natural vegetation in southern Africa. Other important species within the IBA include Martial Eagle, Kori Bustard, Ludwig's Bustard, Black Harrier, Pallid Harrier, Black Stork, Blue Korhaan, Greater Flamingo, Secretarybird, South African Shelduck, and Lanner Falcon (Barnes, 1998).

8.5.1.6 Avifaunal Impact Assessment for the Proposed Ishwati Emoyeni WEF (Smallie, 2014)

An avifaunal impact assessment for the proposed Ishwati Emoyeni WEF, located adjacent to the proposed Umsinde Emoyeni site, was conducted by Smallie (2014).

The avifaunal study included four seasonal surveys across a 12 month period and recorded 181 bird species. Winter surveys recorded the lowest number of species, 96, while the most species, 162 were recorded in spring. Of the total 181 species recorded, 25 priority species were observed. Importantly however, the following power line collision or electrocution prone species were identified as being at risk and/or were recorded in relative abundance: Blue Crane, Ludwig's Bustard, Kori Bustard, Karoo Korhaan, Jackal Buzzard, Verreaux's Eagle and Booted Eagle. An active Verreaux's Eagle nest was located by Smallie (2014) at 31°43'39.50"S; 23°40'44.07"E.

During the scoping phase for the proposed Ishwati Emoyeni project, comments made by I&APs highlighted that the Badsfontein Dam, located about 13 km from the most western proposed turbine string of the Umsinde Emoyeni WEF Phase 2, may be an important stopover point for birds, such as flamingos and other migratory species. It was also noted that Pectoral Sandpiper may be an occasional visitor to the dam. The Badsfontein dam was monitored by Smallie (2014) and was found to have higher densities of water-associated bird species than the broader area. A wetland count was also conducted by Arcus at Badsfontein dam during the 12 month pre-construction bird surveys.

8.5.2 12 Month Pre-Construction Monitoring Results

8.5.2.1 Species Summaries and Seasonal Surveys

A combined total of 181 species was recorded in and around the WEF and control sites during the four seasonal surveys (Figure 8.7). This includes 29 priority species and 28 South African endemic or near endemic species. A total of 13 red data species were observed across all four surveys (Table 7), including three species listed as regionally *Endangered*, four as *Vulnerable* and six as *Near-threatened* (Taylor 2015).

Table 3 Red Data Species Recorded During Four Seasonal Surveys on the WEF and Control Site

Species	Red Data Status (Taylor, 2015)
Black Harrier	Endangered
Ludwig's Bustard	Endangered
Martial Eagle	Endangered
Lanner Falcon	Vulnerable
Secretarybird	Vulnerable
Southern Black Korhaan	Vulnerable
Verreauxs' Eagle	Vulnerable
African Rock Pipit	Near-threatened
Blue Crane	Near-threatened
Double-banded Courser	Near-threatened
Greater Flamingo	Near-threatened
Karoo Korhaan	Near-threatened
Kori Bustard	Near-threatened

Generally the highest diversities and abundances of small passerine species were restricted to drainage lines, particularly where relatively dense riparian scrub habitat existed. The open plains and plateaux were frequented mainly by larks, pipits, chats, bustards and korhaans. Waterbirds were concentrated around farm dams and raptors were generally observed flying over all habitat types. Key foraging areas for raptor species such as Verreaux's Eagle, Jackal Buzzard and Rock Kestrel were generally observed along cliff faces at higher altitude VPs, with flight paths often occurring along ridgelines. In contrast, Blue Crane, korhaans and bustards were observed foraging on the lower altitude plains, especially in the south of the WEF site. Large flocks of Blue Crane seem to forage in the area, especially during winter and near the cultivated fields on the WEF site's southern border. Birds of the family *Corvidae* (crows and ravens) were abundant with White-necked Raven, in particular, being one of the most regularly observed larger species.

Verreauxs' Eagle is a species of concern to the development and was observed across the site in high abundance with more than one pair being observed at a time on several occasions and up to 6 individuals being seen at the same time. Similarly, Blue Crane was regularly observed in large numbers within and around the WEF site.

Key findings from the four seasonal surveys can be summarised as follows:

- 181 species were identified;
- 29 priority species;
- 28 South African endemic or near endemic species;
- The overall average ± SD passage rate for the WEF was 0.97 ± 2.02 target birds per hour of observation;
- Raptors constituted the majority of flight paths recorded within the WEF, with Verreaux's Eagle being the most commonly recorded vantage point target species;

- A total of 472 flights and 665 individuals of 23 different priority species were recorded on the WEF site. 252 (53.4 %) of these flights were by Verreaux's Eagle. This red data species is listed as *Vulnerable* (Taylor 2015);
- Flat open areas were utilised by relatively high numbers of terrestrial species such as the red data Blue Crane, Southern Black Korhaan, Karoo Korhaan and Ludwig's Bustard;
- Blue Crane accounted for 17.8 % of the total number of incidental observations and 39 % of the total number of incidentally recorded individuals and Karoo Korhaan accounted for 24.7 % of the total number of incidental observations and 17.4 % of the total number of incidentally recorded individuals in the WEF site;
- While Blue Crane, Karoo Korhaan, Ludwig's Bustard and Southern and Northern Black Korhaan were encountered regularly as incidental observations they are not well represented in flight path surveys, with Blue Crane accounting for only 6.5 % and Karoo Korhaan accounting for only 2.9 % of the total number of flight paths recorded in the WEF site; and
- Observations within the control site were also dominated by flight path records of Verreaux's Eagle.

8.5.2.2 Nest Survey Species Summary

The most important findings of the nest surveys (Figure 8.7) were:

- 21 active Verreaux's Eagle nests, of which five are situated within the WEF site boundary.
- One active Martial Eagle nest outside the WEF site approximately 3.2 km from the site boundary to the west.
- Seven Jackal Buzzard nest sites, five of which are situated within the WEF site.
- 22 Rock Kestrel nest sites, seven of which are situated within the WEF site.
- One Rufous-breasted Sparrowhawk nest situated within the WEF site.
- One Pale Chanting Goshawk nest situated within the WEF site
- One Peregrine Falcon nest situated outside the WEF site
- The most extensive and suitable cliff nesting habitat/s are situated on the periphery of the WEF and concentrated in the south and east of the WEF site.

8.5.3 Avifaunal Community Summary

The avifaunal community in the area was estimated by combining all available records of birds in the area with the conducted surveys. These data sources report a combined total of 240 species, including 33 priority species and 33 endemic or near-endemic species (Volume III Avifaunal Specialist Report[16]). Seventeen species with red data status have been recorded and are therefore likely to at some stage be present on Phase 1 and/or Phase 2 of the proposed development.

They include the following red data species: Ludwig's Bustard (*Endangered*), African Marsh Harrier (*Endangered*), Martial Eagle (*Endangered*), Black Harrier (*Endangered*), Double-banded Courser (*Near-threatened*), Greater Flamingo (*Near-threatened*), Karoo Korhaan (*Near-threatened*), African Rock Pipit (*Near-threatened*), Kori Bustard (*Near-threatened*), European Roller (*Near-threatened*), Blue Crane (*Near-threatened*), Verreaux's Eagle (*Vulnerable*), Lanner Falcon (*Vulnerable*), Black Stork (*Vulnerable*), Southern Black Korhaan (*Vulnerable*), Secretarybird (*Vulnerable*) and Blue Korhaan (*Least Concern*).

8.5.4 Avifaunal Discussion

Overall the baseline environment in terms of avifauna at the proposed WEF site was found to be varied and diverse and typical for the habitat types in the region.

[16] Note this Appendix shows 239 species, and excludes the one additional species recorded by Dr. Andrew Jenkins, namely Peregrine Falcon, which brings the total number of species to 240.

The combined avifaunal community which potentially exists on the WEF site comprises of up to 240 species, including 33 priority species, 33 endemic or near-endemic species and 17 red data species. During the 12 months of monitoring 181 of these 240 species were recorded in and around the WEF and control sites, including 29 of the 33 priority species, 28 of the 33 South African endemic or near-endemic species, and 13 of the 17 red data species. These three figures are considered high. This is likely due in part to the high monitoring effort (i.e. person hours spent on site), the large area surveyed during the monitoring, as well as the varied habitats and bird micro-habitats existing throughout the areas covered by the WEF site. However, it is not only the presence (or potential presence) of certain species on a WEF site that is important, but also the abundance of those species as well as their behaviour.

Of the 13 red data species recorded, four (Blue Crane, Verreaux's Eagle, Southern Black Korhaan and Karoo Korhaan) were found to have a moderate to high abundance on the WEF site, and of these only Verreaux's Eagle recorded relatively high to very high flight activity. Therefore, when considering the potential impacts of the proposed development, these species were most important.

Verreaux's Eagle were found to be abundant, widespread and relatively active across the WEF site, and particularly in the south of the site, along prominent ridgelines and near to nest sites. It would be important to afford this species protection by not placing turbines in areas of high recorded flight activity, as well as avoiding prominent ridgelines. Further protection will also be gained by enforcing a strict no-go buffer for turbine placement around the identified Verreaux's Eagle nests.

The density (approximately 1 pair / 57 km^2) of the Verreaux's Eagle population of the WEF site and it's surrounds is broadly comparable with other relatively high density populations of this species studied in other parts of the region (e.g. Nuweveld escarpment, Beaufort West: mean density 1 pair / 24 km^2, Cederberg, W Cape: mean inter-pair distance 4.7 km (n = 22, range 3.4-7.2 km), Sandveld, W Cape: mean inter-pair distance 5.8 km (n = 24, range 1.6 - 15.2 km) – M. Murgatroyd, Jenkins 2014: Pers. comm.). As such, this population, together with the Martial Eagle pair located to the west of the WEF site, represent an important biodiversity asset of the site, and are likely to be important components of the local ecology.

Blue Crane were found across the WEF site, although large flocks were concentrated in the south and near to cultivated lands. Buffering of these cultivated lands should afford protection to this species, and the location of the proposed WEF phases in the most part avoid the areas favoured by this species (particularly the large flocks). The majority of this species flights were below RSH.

Martial Eagle activity was generally infrequently recorded on the WEF site, with a total of seven recorded flights over the 12 month survey period. However, it remains an important species as it is Endangered and is scarce outside of protected areas with the population in the Eastern, Western and Northern Cape approximately 100 - 150 birds (< 1 bird / 5000 km^2) (Hockey *et al.* 2005). Its average breeding territory in north east South Africa is 130 -150 km^2 and at least 280 km^2 in the Nama Karoo and Namibia (Hockey *et al.* 2005) while inter-nest distances in the central Karoo average about 15 km (Boshoff 1993; Machange *et al.* 2005). These large territories show that this is a wide ranging species. It's also important to note that this species is monogamous and the pair bond is often maintained over several seasons, regularly re-using and breeding at the same nest site. The active nest site located will need to be appropriately buffered.

Of the two korhaan species recorded flying, only Karoo Korhaan was regularly recorded flying on site, and the vast majority of flights were below RSH, and therefore this species is considered to be more at risk from power line collisions and disturbance than from turbine collisions.

High numbers of various waterbird and waterfowl species were observed at the various dams surveyed. This shows the importance of farm dams for avifauna in the area, and these features have been buffered accordingly. It was also considered that there would be movement of these species across the WEF site, from dam to dam. VP monitoring did not pick up high levels of waterbird / waterfowl movements, with only flights of Egyptian Goose and South African Shelduck being recorded with some regularity, and no clear 'fly ways' could be identified. However, it is important to note that many of these species fly before dawn and after dusk, and may these nocturnal and crepuscular movements may have been missed. This has been considered in the impact assessment.

Although not a red data species or a priority species, the Rock Kestrel population of the area was substantial. The Avisense survey team found pairs of this species "apparently and definitely" resident on most of the cliffs that were surveyed. The total nest sites for this species is therefore only a sample of the population present, given that there were many small cliffs in the area that were not visited. This species has been known to collide with turbines in South Africa (pers. obs.), and is therefore potentially at risk.

8.6 BATS

The methodology for the bat monitoring consisted of a desktop review of literature and legislation, 12 months of fieldwork, data analysis and report writing. The fieldwork consisted of static ultrasonic monitoring at 17 bat monitoring stations (Plate 7), roost surveys, driven transect surveys and live trapping and release. Seventeen static monitoring sites were set up in mid July 2013 and the fieldwork ran from mid-July 2013 to mid-July 2014, with 95 % of the possible nights and hours of recording time over the year over the total monitoring stations being successful.

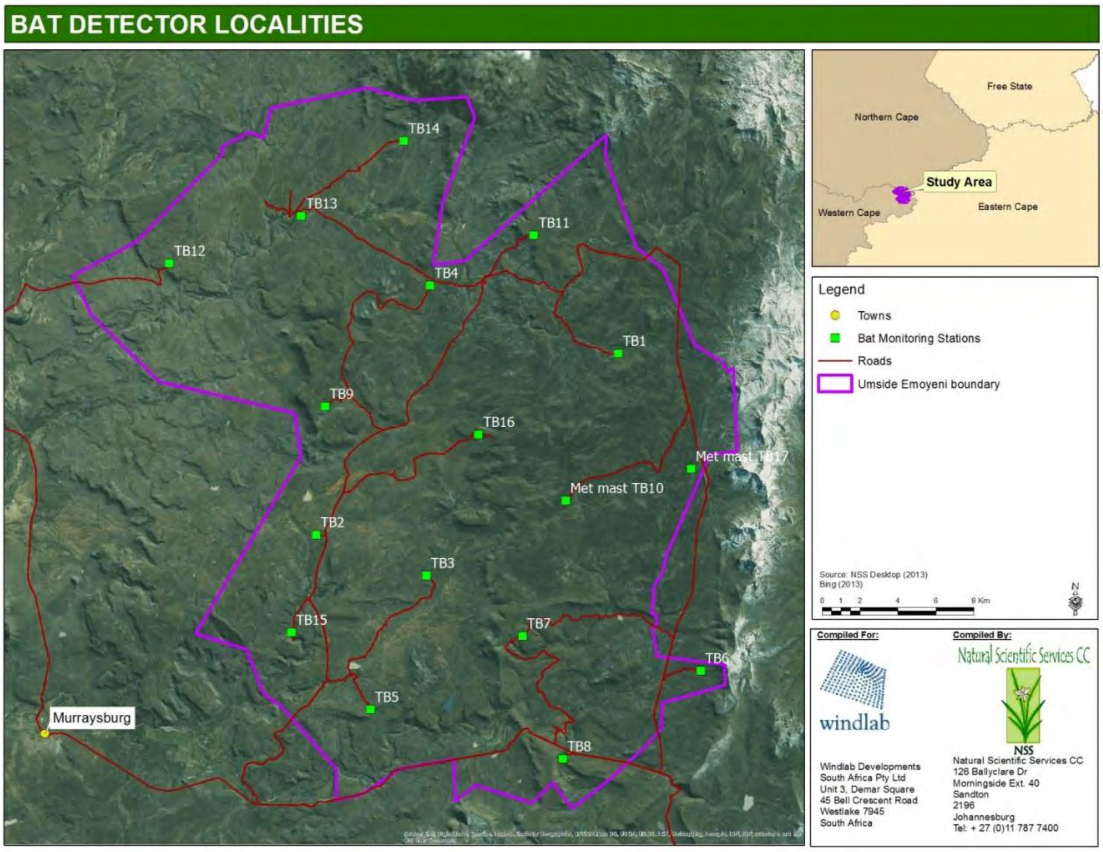


Plate 7 Bat Detector Localities from NSS (2014) Study

Of the 14 potentially occurring bat species at Umsinde, six have been confirmed for the site and two additional ones suspected based on call structure or evidence of night roosts - *Miniopterus natalensis, Tadarida aegyptiaca, Rhinolophus clivosis, Rhinolophus capensis, Cistugo lesueri, Eptisicus hottentotus, Neoromicia capensis* and *Nycteris thebaica*.

The annual average bat passes per date for Umsinde Emoyeni WEF was 29.1 bat passes/ date at 10 m and 8.6 bat passes/ date at 60 m. The annual average bat passes per hour for Umsinde Emoyeni WEF was 2.4 bat passes / hour at 10 m and 0.7 bat passes / hour at 60 m. There is approximately 71 % less activity at 60 m compared with at 10 m.

Most bat activity seems to occur in the lower lying warmer areas of the site (less than ±1450 m), with bats being found along the higher ridge areas only during warmer periods. Whilst average activity ranged between 3 and 158 bat passes / date at the various stations at 10 m and 60 m respectively, over 500 bat passes / date at TB13, over 700 bat passes / date at TB15, over a 1000 bats passes / date at TB8, over 40 bat passes / date at TB10 top and over 150 bat passes / date at TB17 top were experienced on some dates. November and autumn had the most number of nights with these distinct peaks.

There is definitely evidence of seasonal movement or migration events happening. This is particularity evident for Species Group C bats (consisting only of *Miniopterus natalensis*), but Species Group A and B bats also displayed some unexpected activity fluctuations. Autumn and spring and early summer are definitely key activity times at Umsinde both at 10 m and 60 m.

From the activity vs time of night results, the following overall comments can be made based on the monitoring results:

- In winter there is generally lower activity, however, there is a distinct peak in activity from sunset for approximately two hours.
- In spring, bat activity definitely increases from winter and there is a peak of activity from sunset for approximately 3 hours. However, there remains activity throughout the night.
- In summer, activity levels are very similar to spring, except that bat activity remains equally active throughout the night.
- In autumn, there is a peak in activity for Species Group A and B bats after sunset, but bat activity for Species Group C bats remains constant throughout the night.

From the activity vs time of night results, the following overall comments can be made based on the 10m results:

- In all seasons, Species Group A bats dominated, with some Species Group B activity.
- There is a more defined peak in activity immediately after sunset for these two groups, however, activity remains throughout the night.
- In Autumn, Species Group C bats are active throughout the night.

80 % of bat activity within the rotor swept zone at Umsinde Emoyeni WEF occurs within wind speeds of less than 7.75 m/s. 80% of bat activity within the rotor swept zone at Umsinde Emoyeni WEF occurs within temperatures of greater than 13.38°C.

Six confirmed and 14 potential bat roosts were located at Umsinde Emoyeni WEF (Plate 8). The roost types that were identified included house roof and tree roosts, rock overhangs in the gorges and small caves/ overhangs in the rocky outcrops. There seems to be a *Miniopterus natalensis* roost very close to mast TB 13, under a large inaccessible overhang in a deep gorge. Other species of bat could also be roosting in the gorge.

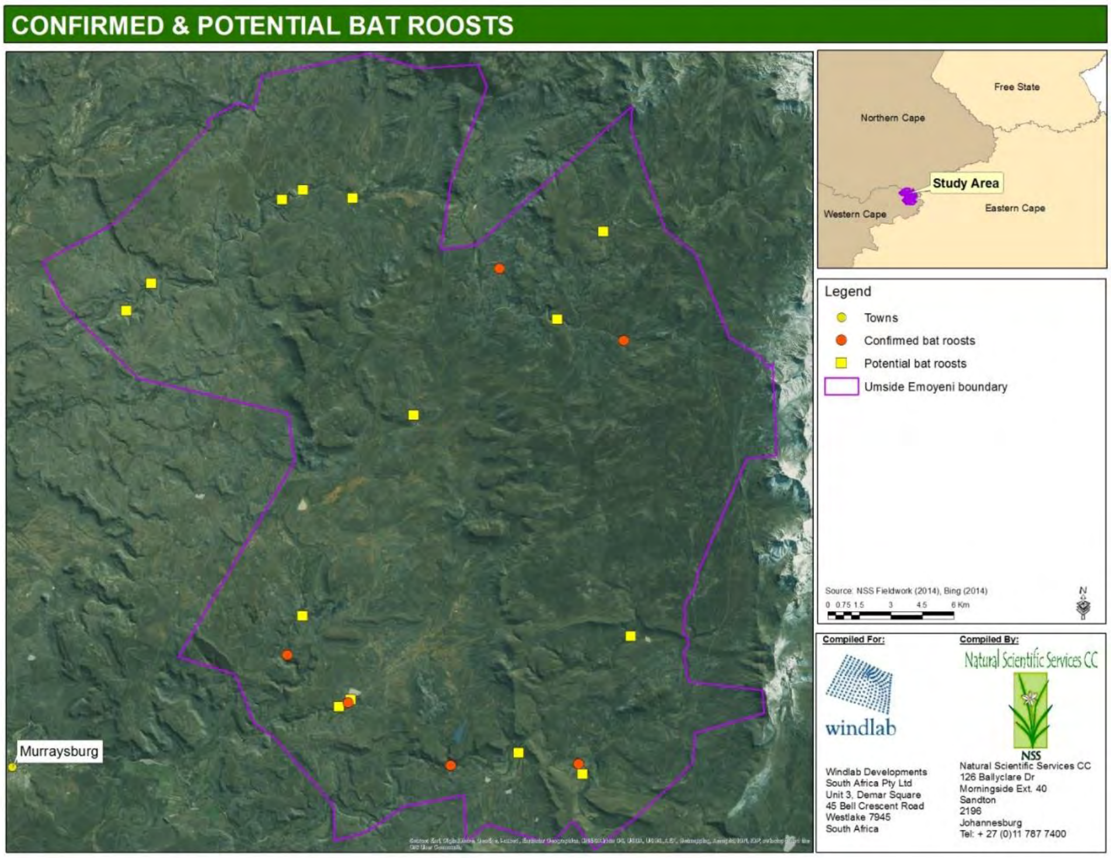


Plate 8 Confirmed and Potential Roosts at Umsinde Emoyeni WEF

Transect surveys confirmed what the static monitoring stations had revealed, that bat activity is highest in the lower valley and ravine areas. Bats are using these areas to forage and as movement corridors.

8.7 SOCIO-ECONOMIC

8.7.1 Administrative Context

The proposed WEF is located in the Beaufort West Local Municipality (BWLM) of the Western Cape Province. The BWLM is one of three Local Municipalities that make up the Central Karoo District Municipality (CKDM). The administrative seat of the BWLM and CKDM is Beaufort West. A small section of the site is located in the Ubuntu Local Municipality (ULM) within the Northern Cape Province. The ULM is one of eight local municipalities that make up the Pixley ka Seme District Municipality (PKSDM). The town of Victoria West is the administrative seat of the ULM. The main settlements in the CKDM include, Beaufort West, Nelspoort, Murraysburg, Prince Albert, Leeu Gamka, Prince Albert Road, Matjiesfontein and Klaarstroom.

Beaufort West: Beaufort West is the gateway to the Western Cape as well as the main service and development centre for the area. The town has a broad range of lower-order shops and social facilities and is the biggest retail and service sector in the District. There are a number of schools of all levels, a hospital, police station and municipal offices (CKDM IDP 2012-2017).

Nelspoort: Nelspoort is a small dormitory settlement located 42 km northeast of Beaufort West, just south of the N1, and one of the many small villages established to serve the rail service. The local school was closed down and the closest school is at Restvale, which is

3 km away. There are no shops or services in Nelspoort, with the exception of a postal agency. Very few public transport services operate from Nelspoort (CKDM IDP 2012-2017).

Murraysburg: Murraysburg is located on the R63 between Victoria West and Graaff-Reinet. It is an exceptionally poor town, with few businesses remaining. Unemployment is high and social problems due to poverty and destitution abound. There is no rail connection to Murraysburg and residents depend on road transport links to larger towns, Graaff-Reinet being the closest (CKDM IDP 2012-2017).

Prince Albert: Prince Albert is the second largest settlement in the Central Karoo District. It is located 400 km north of Cape Town and 170 km southwest of Beaufort West (CKDM IDP 2012-2017). The town has a well-developed tourism sector.

Leeu Gamka: The settlement of Leeu Gamka is located on the N1 national route and the main railway line to Cape Town. Inhabitants rely on rail transport to Beaufort West, which is located approximately 80 km to the northeast (CKDM IDP 2012-2017).

Prince Albert Road: This settlement is located on the N1 and on the main north-south railway line. It is a very small settlement that was originally established to serve the railway station. The daily Cape Town to Pretoria rail service stops at Prince Albert Road (CKDM IDP 2012-2017).

Laingsburg: Laingsburg is a relatively small service centre situated approximately 200 km from Cape Town on the N1. It is a major petrol stop for much of the through traffic, especially passenger cars and trucks (CKDM IDP 2012-2017).

Matjiesfontein: This small, historic settlement is situated off the N1 between Laingsburg and Beaufort West. It has a hotel, a museum, a church and a railway station. The daily Sholoza Meyl Cape Town to Pretoria service stops at Matjiesfontein. Most people who visit the town are travellers and tourists who are aware of the historic nature of the village and the area (CKDM IDP 2012-2017).

Klaarstroom: Klaarstroom is a small rural village east of Prince Albert close to the northern access to Meiringspoort. The town is a residential village with limited facilities. Those who are employed work on the local farms. The latter have better agricultural potential than those in the more northern areas of the Central Karoo (CKDM IDP 2012-2017).

Beaufort West is the most populated of the local municipalities with a population size of 49 586, followed by Prince Albert (13 136) and Laingsburg (8 289) (Census 2011). The main language spoken in the district is Afrikaans followed by IsiXhosa.

8.7.2 CENTRAL KAROO DISTRICT MUNICIPALITY

8.7.2.1 Economic Overview

The CKDM IDP (2012-2017) indicates that economic development remains a developmental challenge for the DM. This is due to the low population density, distance from large markets and the arid climate. In addition there are high levels of unemployment and poverty and a lack of skilled persons.

In 2008 the CKDM economic growth rate was 6 % compared to the Province's annual growth rate of 4.3 % (CKDM IDP 2012-2017). However, the due to global recession the growth rate in 2009 was 0.2 %, while the Province's economy contracted by 1.2 %. The decline in the growth from 2008 to 2009 was due to the impact of the 2008/09 global recession.

In the Beaufort West LM mining and quarrying displayed a growth rate of 26.9 % while manufacturing recorded a growth rate of 10.12 %. In the Prince Albert LM the construction (15.2 %) and finance, insurance, real estate and business (14.4 %) sectors all displayed strong growth. In the Laingsburg LM construction (11.8 %) and manufacturing (9.7 %) recorded strong growth.

In terms of employment the most important economic sector is the Community, social and personal services sector (16.9 %), followed by Agriculture; hunting; forestry and fishing (15.7 %) and Wholesale and retail trade (14.0 %). The Agriculture sector also plays a key role in the other District Municipalities in the Western Cape, accounting for 27.9 % and 24.2 % of the jobs in the West Coast and Cape Winelands respectively.

8.7.2.2 Employment

The Community survey of 2007 found that the Central Karoo had the lowest percentage of the Western Cape's labour force (0.8 %). At the same time the DM also had the highest unemployment rate (30.8 %). Based on the 2011 Census figures the unemployment rate in the CKDM was 23.1 % compared to 21.6 % for the Western Cape Province. Within the DM the unemployment rates for the BWLM, Prince Albert and Laingsberg LM were 25.5, 17.9 and 19.4 % respectively in 2011 (Census 2011).

In terms of unemployment by population group, the unemployment rate for Black Africans (45.0 %) was greater than any other population group. The figure for Coloureds was 33.4 % while for Whites is was only 2.6 %. Disparities are also found within different age groups, with younger age groups experiencing higher levels of unemployment and representing significantly higher shares of the unemployed in comparison with their share of the labour force. The unemployment rate for those in younger age groups is significantly higher than the older age groups. The differences in unemployment rates between age groups may in part be accounted for in the higher education, skill and experience levels of relatively older workers – these characteristics make work-seekers more attractive to prospective employers and improve their chances of finding employment (CKDM IDP 2012-2017).

CKDM has third lowest proportion of skilled labour force (38.6 %) and the second highest of low skilled (26.6 %) people in the Western Cape. The low skill levels in the CKDM places a strain on the region's economy and poses a challenge to the areas future development (CKDM IDP, 2012-2017). The IDP notes that a large proportion of occupations in the DM are classified as either skilled (39 %) or high skilled (21 %). The concentration of employment opportunities in the skilled sector therefore means that there are relatively few opportunities available to those with low skill levels. The current proportion of low skilled occupations available in the District is 27 % (CKDM IDP 2012-2017). This mismatch in terms of skills levels and employment opportunities highlights the need for individuals to up-skill in order to improve their chances of finding employment within the district CKDM IDP 2012-2017).

8.7.2.3 Household Income

The CKDM IDP (2012-2017) indicates that the 32 % of households in 2009 earned income between R0 and R42 000, 41.8 % earned between R42 000 and R132 000, 23.1 % between R132 000 and R600 000 and 3.1 % earn above R600 000. The IDP notes that the figures indicated that there has been a shift in earning power in the number of people earning at the lower end of the scale while the people in the middle to upper ends of the scale has increased significantly.

8.7.2.4 Poverty Rate and Indigent Households

Research undertaken by Global Insight indicates that the number of people living in poverty in the CKDM in 2010 was approximately 20 200 people. In this regard the CKDM had the highest number of people living in poverty in the Western Cape (32.5 %). Prince Albert has the highest proportion of poor people and it is rising compared to the rest of the district.

According to the Western Cape Department of Local Government information the number of households in the Central Karoo District totalled 14 945 of which 5 903 (39.5 %) were classified as indigent (August 2011). From the Department's information, of the total number of households, 43.1 % received free basic access to water, 40.2 % to electricity, and 39.4 % to sanitation services. Within the CKDM the Beaufort West LM has the highest number of indigent households followed by the Prince Albert and Laingsburg LM.

8.7.3 Beaufort West Local Municipality

The Beaufort West Local Municipality (BWLM) is a category-B municipality, comprising the towns of Beaufort West, Merweville, Nelspoort and Murraysburg in the Central Karoo District. In February 1837, the BWLM became South Africa's first and therefore oldest municipality. It is the centre of an agricultural district based mainly on sheep farming and meat production, and is strategically positioned on the N1 national road, which links Cape Town with the interior of South Africa.

8.7.3.1 Economic Overview

The regional gross value added figure (GVA-R) for the BWLM amounted to R840.741 million in 2009 and accounted for 74.4 % of the total of the regional economy of R1.130 billion, making it the largest economic contributor in the CKDM[17]. The economy of the BWLM grew at a lower rate than the District's economy between the 2001 and 2009 period with the exception of 2003 and 2006 when the BWLM economy outperformed the economy of the District. Beaufort West's economy grew at an annual average rate of 3.5 % over the period 2001 to 2009 compared to the District's annual average growth rate of 3.6 %. In 2008, Beaufort West's and the District's economic growth peaked at 6 % and 5.3 % respectively, at the height of the global financial crisis. However, in 2009 the economic growth for BWLM and the District were stagnant. In terms of sectors, the leading sector contributors to the BWLM economy in 2009 were; finance (29 %); community services (27 %), agriculture (14 %) and transport (7 %). The agricultural sector's contribution to the local economy decreased from 15.2 % to 14.9 % between 2001 and 2009. The finance sector's contribution increased from 19.7 % to 28.9 %, whilst the community services sector's contribution decreased marginally from 27.3 to 26.6 % between 2001 and 2007.

8.7.3.2 Household Income

The majority of households (51.3 %) in Beaufort West had an income of between R4 801 and R38 400 per annum. Of all the households, 9.5 % had no income, 3.3 % earned between R0 and R4 800 per annum, 5.8 % between R 4 801 and R 9 600, 21.7 % between R 9 601 and R 19 600, and 23.8 % between R 19 601 and R 38 200 per annum (Census 2011).

In 2007, there were 11 160 social grant beneficiaries, of which 57.2 % beneficiaries received the child support grant, followed by the old age pension grant (23 %) and the disability grant (16.7 %). The municipality offers additional social support through its indigent policy. The indigent policy provides free and discounted rates on basic services such as water, electricity, sanitation, refuse and property rates. According to the municipality, there were 4 147 indigents registered in the 2010/11 financial year (BWLM IDP 2012-2017).

8.7.4 Summary of Central Karoo and Beaufort Local Municipalities

The population of the CKDM increased by from 60 483 in 2001 to 71 011 in 2011, which represents an increase of ~ 17.4 %. The population of the BWLM increased from 43 290

[17] GVA and Gross Domestic Product (GDP) are similarly related concepts. GVA excludes taxation and subsidies, while these are included in GDP.

in 2001 to 49 586 in 2011 (~ 14.5 %) over the same period. This represents an average annual increase of ~ 1.6 % and 1.36 % for the CKDM and BWLM respectively. The increase in the population in both the CKDM and BWLM was linked to an increase in the economically active 15-65 year age group. The increase in the economically active 15-65 age group in also reflected in the decrease in the dependency ratios in both the CKDM and BWLM (see below). As expected, the number of households in both the CKDM and BWLM increased between 2001 and 2011. The size of the household sizes in both areas decreased marginally, from 3.8 to 3.6 in the CKDM and 3.9 to 3.6 in the BWLM.

Table 4 Overview of key demographic indicators for the CKDM and BWLM

	CKDM		BWLM	
ASPECT	2001	2011	2001	2011
Population	60 483	71 011	43 290	49 586
% Population <15 years	32.7	30.5	32.8	31.5
% Population 15-64	61.4	63.3	61.6	62.6
% Population 65+	6.0	6.2	5.7	5.9
Households	15 009	19 076	10 540	13 089
Household size (average)	3.8	3.6	3.9	3.6
Formal Dwellings %	95.7 %	97.0 %	95.8 %	97.9 %
Dependency ratio per 100 (15-64)	62.9	58.0	62.4	59.7
Unemployment rate (official) - % of economically active population	36.2 %	23.1 %	38.2 %	25.5 %
Youth unemployment rate (official) - % of economically active population 15-34	47.3 %	30.9 %	49.7 %	34.5 %
No schooling - % of population 20+	17.3 %	10.1 %	17.2 %	10.1 %
Higher Education - % of population 20+	6.1 %	7.1 %	6.0 %	6.5 %
Matric - % of population 20+	14.9 %	21.5 %	16.4 %	23.6 %

Source: Compiled from StatsSA Census 2011 Municipal Fact Sheet

The majority of the population in the BWLM is Coloured (73.5%), followed by Black Africans (16.3%) and Whites (9.2%) (Census, 2011). The dominant language within the Municipality is Afrikaans (~81.7%), followed by isiXhosa (~10.4%) and English (~2.4%) (Census 2011).

8.7.4.1 Municipal services

The provision of and access to municipal services as measured in terms of flush toilets, weekly refuse removal, piped water and electricity, increased in both the CKDM and BWLM for the period 2001 to 2011 (Table 5). There have been significant improvements in the number of households with access to piped water inside their dwellings in both the CKDM and BWLM. These improvements also contribute significantly to the overall improvement in the quality of life of the residents of the CKDM and BWLM.

However, the service levels in the CKDM and BWLM, with the exception of piped water inside dwellings for the BWLM, are lower than the 2011 provincial averages for the Western Cape Province. The provincial figures are flush toilets (85.9 %), weekly refuse removal (89.9 %), piped water (78.7 %) and electricity (93.4 %).

Table 5 Overview of access to basic services in the CKDM and BWLM

	CKDM		BWLM	
	2001	2011	2001	2011
% households with access to flush toilet	75.1	77.6	80.2	83.2
% households with weekly municipal refuse removal	78.1	78.7	82.4	83.7
% households with piped water inside dwelling	55.5	77.2	57.5	81.3
% households which uses electricity for lighting	83.9	89.4	86.6	92.0

Source: Compiled from StatsSA Census 2011 Municipal Fact Sheet

8.7.5 PIXLEY KA SEME AND UBUNTU MUNICIPALITY

8.7.5.1 Demographic overview

The population of the PKSDM increased by from 166 547 in 2001 to 186 351 in 2011, which represents an increase of ~ 12 % (Table 6). The population of the ULM increased from 16 375 in 2001 to 18 601 in 2011 (~ 14 %) over the same period. This represents an average annual increase of ~ 1.12 % and 1.27 % for the PKSDM and ULM respectively. The increase in the population in the PKSDM was linked to an increase in the 15 - 64 and the 65 and older age groups. This is likely to reflect a situation where the majority of job seekers in the 15 - 64 age group are single males who have not settled down and started a family in the area. In the ULM the increase was in the under 15 age group while there was no change in the economically active group of 15 - 64 and a decrease in the over 65 group. As expected, the number of households in both the PKSDM and ULM increased between 2001 and 2011. The size of the household sizes in both areas essentially remained the same, namely in the region of 3.5 - 3.8.

The majority of the population is in the ULM was Coloured (69.8 %), followed by Black Africans (21.3 %) and Whites (7.6 %) (Census, 2011). The dominant language within the Municipality is Afrikaans (~81.4 %), followed by isiXhosa (~12.3 %) and English (~1.8 %) (Census 2011).

Table 6 Overview of key demographic indicators for the PKSDM and ULM

	PKSDM		ULM	
ASPECT	2001	2011	2001	2011
Population	166 547	186 351	16 375	18 601
% Population <15 years	32.6	31.6	33.2	33.3
% Population 15-64	61.5	62.4	61.1	61.1
% Population 65+	5.9	6.1	5.7	5.6
Households	41 707	49 193	4 163	5 129

Household size (average)	3.8	3.7	3.7	3.5
Formal Dwellings %	84.7 %	86.3 %	93.0 %	87.6 %
Dependency ratio per 100 (15-64)	62.7	60.4	63.8	63.5
Unemployment rate (official) - % of economically active population	36.4 %	28.3 %	34.1 %	29.1 %
Youth unemployment rate (official) - % of economically active population 15-34	44.1 %	35.4 %	41.5 %	34.8 %
No schooling - % of population 20+	27.1 %	14.6 %	30.6 %	16.4 %
Higher Education - % of population 20+	5.7 %	6.1 %	8.0 %	6.0 %
Matric - % of population 20+	12.9 %	20.5 %	12.2 %	18.7 %

Source: Compiled from StatsSA Census 2011 Municipal Fact Sheet

8.7.5.2 Municipal services

The municipal service levels in the PKSDM and ULM all improved over the period 2001 to 2011 (Table 7). This represents a socio-economic improvement. The service levels in the PKSDM and ULM are, with the exception of households that use electricity for energy, all higher than the provincial averages for the Northern Cape Province (85.4 %).

Table 7 Overview of access to basic services in the PKSDM and ULM

Municipal Services	PKSDM		ULM	
	2001	2011	2001	2011
% households with access to flush toilet	45.4	65.7	38.4	64.3
% households with weekly municipal refuse removal	67.8	72.6	63.8	66.6
% households with piped water inside dwelling	32.8	47.0	35.0	49.2
% households which uses electricity for lighting	75.1	85.1	75.7	84.8

Source: Compiled from StatsSA Census 2011 Municipal Fact Sheet

8.8 HERITAGE AND PALAEONTOLOGICAL HERITAGE

The study area lies in the eastern part of the Great Karoo, above the escarpment of the Camdeboo Plains in the Northern and Western Cape Provinces. Since this landscape is generally only moderately transformed, it contains a wealth of well-preserved archaeological sites; one of the deepest palaeontological sequences in the world, and in later years was the last refuge of the Southern African San before their ancient lifestyle became extinct during settlement of the land by Dutch colonists.

Palaeontology: The proposed Umsinde Emoyeni WEF project area is largely underlain by Permian fluvial sediments of the Lower Beaufort Group (Karoo Supergroup) that have yielded a wealth of important fossil remains from the Murraysburg region over the past century or more. These include diverse vertebrate fossils of the Late Permian *Cistecephalus* and *Dicynodon* Assemblage Zones such as gorgonopsian, therocephalian and cynodont predators as well as small- to large-bodied herbivorous dicynodonts, among others. Recent palaeontological fieldwork confirms that well-preserved fossils belonging to a range of tetrapod groups are present at the surface in a high proportion of sites where Lower Beaufort Group bedrocks are well-exposed. Other fossil groups represented here include concentrations of medium to large vertebrate burrows, low-diversity invertebrate trace fossils and vascular plant remains (*e.g.* horsetail ferns). The paleo-sensitivity of the Umsinde Emoyeni study area is therefore rated as high.

Palaeontological fieldwork during the six-day field assessment of the Umsinde Emoyeni WEF study area focussed mainly on the examination of selected overbank mudrock exposures of the Lower Beaufort Group since this is where the majority of the fossil vertebrate material is generally preserved and found. These sites include natural exposures on hillslopes, in erosion gullies and along stream and riverbanks as well as artificial exposures in road cuttings, borrow pits and farm dams. Given the considerable size of the study area, it was only feasible to examine some of the numerous land parcels involved and a very small sample of the potentially fossiliferous sites within them. The principal localities visited and fossils observed are listed in the specialist palaeontological report in Volume III. Please note that fossil sites are *not* explicitly mapped in this report. This is for conservation reasons and also because mapping might give the very misleading impression that areas between known sites are fossil-free, which is *far from being the case*. In general, recent fieldwork has reinforced the impression gained from the preceding palaeontological heritage desktop analysis that the study area near Murraysburg area is indeed unusually rich in Late Permian fossil vertebrate remains, as well as associated trace fossils such as vertebrate burrows. Where extensive mudrock exposures are available, fossils can generally be found, occasionally in comparatively high concentrations. Due to low levels of tectonic deformation (*e.g.* cleavage development) and weathering, the preservation of the fossils is often good, so many specimens are identifiable and may well be of research value. Nevertheless, well-preserved and well-articulated vertebrate fossil remains are always rare, while their distribution is largely unpredictable on the scale of this project.

Vertebrate fossils of the *Cistecephalus* Assemblage Zone were recorded during this study within the sandstone-rich package of the Balfour Formation known as the Oudeberg Member, while slightly younger *Dicynodon* Assemblage Zone fossils were also recorded from the overlying mudrock-rich package of the Daggaboersnek Member. The detailed mapping of the various members of the Balfour Formation in the study area and their fossils would require considerable additional fieldwork that lies outside the scope of the present palaeontological heritage assessment.

Late Permian vertebrate fossil remains were recorded from two main preservational settings:

- Transported, usually fragmentary and disarticulated, bones and teeth within channel or crevasse splay sandstones (Plate 9) as well as – more commonly – within basal channel lag breccio-conglomerates in association with reworked calcrete glaebules and mudrock intraclasts).

Plate 9 Skull of a small dicynodont embedded within a baked quartzitic channel sandstone, Farm 6/109 (Loc. 567) (Scale in mm and cm). Such fossils are very difficult to prepare out from the matrix.

- Disarticulated to semi- or well-articulated skeletal remains embedded within overbank mudrocks. Specimens include several well-preserved skulls of small to large-bodied therapsids ("mammal-like reptiles") such as cynodonts, therocephalians, gorgonopsians and dicynodonts (Plate 10). These fossils often occur in association with, and partially encased by, pedogenic calcrete concretions representing ancient soils on the semi-arid Late Permian floodplain. The fossils are variously found partially enclosed by the mudrock or calcrete matrix, fully-exposed by natural weathering, or as downwasted or transported material at the land surface. Secondary baking within the thermal aureole of dolerite intrusions has imparted a white, porcellanous appearance to some fossil remains (Plate 11).

Plate 10 Concentration of reworked, weathered bone fragments within a ferruginised pedogenic calcrete lens intercalated within grey-green overbank mudrocks (Loc. 550) (Scale in cm)

Plate 11 Dark hornfels containing numerous disarticulated tetrapod postcrania with a white, porcellanous appearance due to thermal metamorphism during dolerite intrusion (Loc. 523) (Scale in cm)

In addition to the vertebrate skeletal remains, other fossil groups of note from the study area include:

- Sparse to locally-concentrated moulds of vascular plants, principally the stems of sphenophytes (horsetails) and other reedy plants. Transported woody stems and twigs within channel sandstones may show preferential current orientation (Loc. 553). No petrified wood material was recorded during this study, although it may well be present here, for example in association with basal channel sandstones or reworked into alluvial or surface gravels.
- Low diversity invertebrate trace fossil assemblages, such as the horizontal burrows preserved on the sole surfaces of some sandstone beds. The serially-repeated, paired ridge-like casts shown on a sandstone sole are of unknown origin (they are possibly tool marks).

Horizons with several to numerous vertebrate burrows (10-30 cm diameter), preserved as sandstone-infilled casts embedded within overbank mudrocks ,as washed-out casts on sandstone sole surfaces as secondarily-calcretised helical casts. Rarely the casts may contain bone fragments (possible washed-in) (*e.g.* Loc. 526).

Pre-colonial heritage: This consists of occasional open air scatters, several rock shelters, and San rock painting sites. The spatial patterning of the heritage sites indicates that the locations of sites were related to the availability of water sources. Valley bottoms and sides proved to be the most sensitive areas, most of which have been excluded from both Phase 1 and Phase 2 areas. Rock engraving sites were fairly common, including some that appear to be ancient. The range includes very complex patterns, animal forms and mere scribblings. The engravings on dolerite boulders are found throughout the project area. There is one rock painting site in the study area worthy of Grade 2 status. This site must be formally documented before construction commences. It is not anticipated that archaeological sites and overhangs will be significantly impacted by the proposal. However, the construction of both the Phase 1 & 2 WEFs, and grid connections will impact rock engravings on dolerite surfaces and boulders. Mitigation will be required to identify, protect and move them if need be.

Colonial period heritage: Farm houses and structures within the project area are of interest, and at least 5 buildings are worthy of formal grading. These are 19th century farm houses and barns that are of heritage interest graded between 3A and 3B. There are numerous stone kraals and lesser stone features in many areas. Most of the historic farm houses are no longer lived in and are deteriorating. There are also formal and informal cemeteries all situated in alluvial soils. These will not be affected by the proposals. No structures will be physically impacted by the proposals, however sensitive re-use of abandoned farm houses is encouraged.

Landscape and setting: The overall project area is highly scenic, comprising of varied topography, ranging from high dolerite plateaus, ridges, canyons and plains. Overall a landscape quality grading of 3A – 3B is warranted. The proposed activities have avoided many sensitive areas by siting both phases of the wind energy facility on the more remote and desolate high dolerite hills. None-the-less there will be a tangible change to the sense of place through a loss of remoteness and wilderness qualities after the industrial presence is established. Because wind turbines are typically so large, their visibility radius is up to 20 km which will affect the scenic qualities of the area well beyond the borders of the Phase 1 and Phase 2 WEFs. Unfortunately the impact cannot be mitigated. The accumulative impact of this and other proposals in the area could result in impacts to the iconic context of the Great Karoo at large.

Graves: Almost all the graves found in the project area lie within proximity of farm houses. They were all located on the alluvial plains of rivers where the soil was deep enough to bury a body. Generally soil depth is very shallow in the study area. It was unusual to find formal graves with inscriptions – most of those located were very humble graves built from natural materials, often covered with a low mound decorated with pebbles and a simple head and foot stone. One formal graveyard was recorded at Bakensklip.

Archaeology: Archaeological sites are relatively uncommon in the study area, of which the majority recorded consisted of rock engravings. Late Stone Age sites that were found were associated with the sides of and ridges above river valleys, taking the form of open artefact scatters (very few) and low stone alignments, curved or circular. Of interest is that almost all Late Stone Age ceramics located are of the grit tempered variety which contrasts greatly with observations from the ZVAP project between Hanover and the Sneeuberge where grass tempered ceramics dominate. Middle and Early Stone Age sites are extremely scarce being limited to a few occurrences and scatters. This is in contrast with the general archaeology of the Eastern Karoo which is generally well represented in all industries.

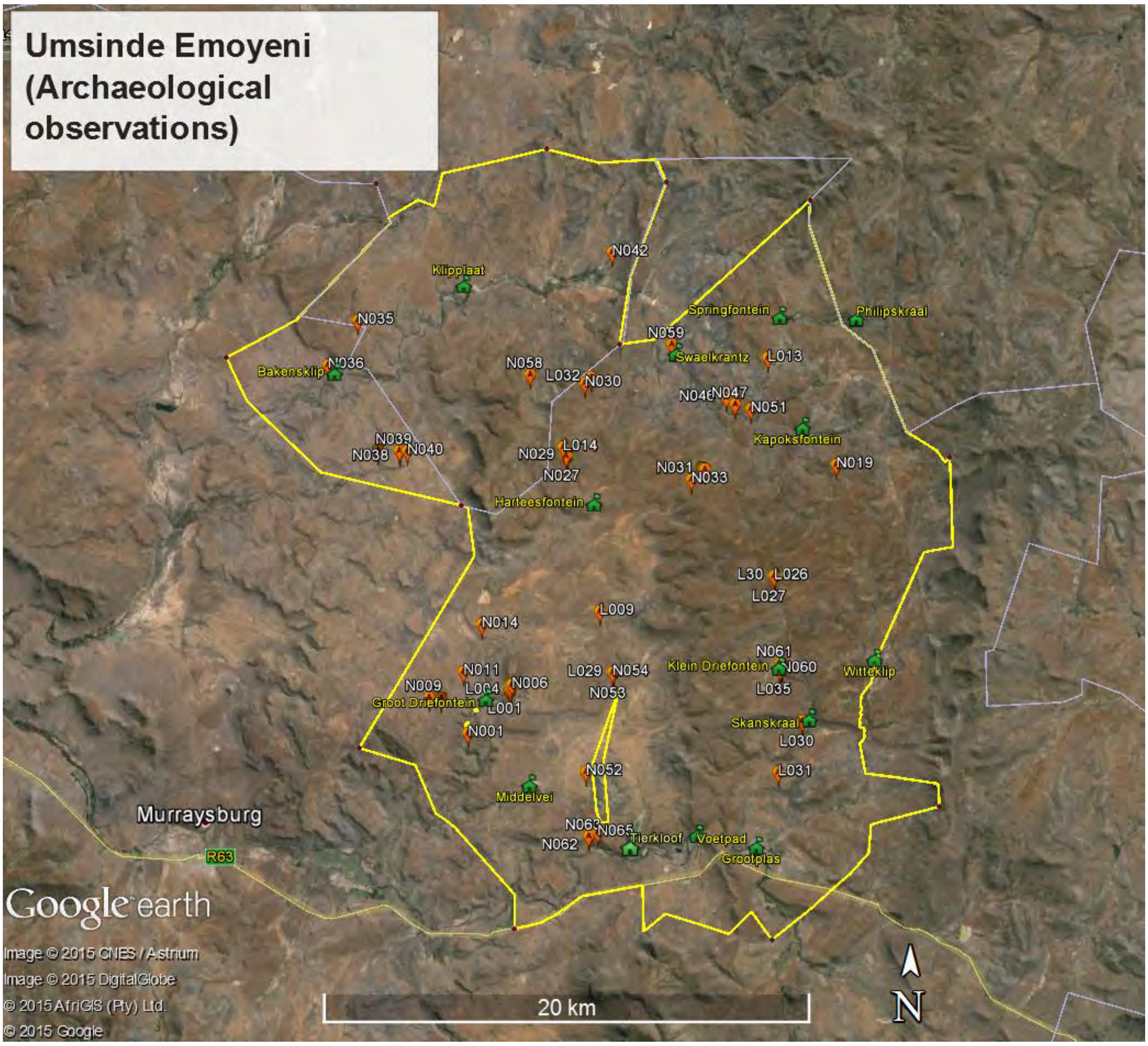


Plate 12 Archaeological Sites within the Umsinde WEF

8.9 VISUAL

The study area forms part of the Great Karoo, an area renowned for its wide open spaces, serenity, quiet and starry skies at night, qualities which attract both local and overseas visitors. The dolerite koppies, scarps and rock outcrops are attractive scenic features, being also visually sensitive. The rural character of the study area is noticeably intact and free of visual intrusions, such as powerlines.

A high ridgeline outside the eastern boundary of the project area would provide a useful visual barrier for areas to the east of the proposed WEF. Other smaller ridges and koppies would also provide some visual screening.

Sensitive receptors, which would need to be considered, include Murraysburg, a historic settlement with a number of noteworthy buildings, commuters and visitors using the R63, an important arterial route linking Graaff-Reinet and Murraysburg with the N1, the two gravel roads connecting the R63 with Richmond, as well as game farms and guest farms, such as Ratelfontein, Badsfontein and Brandkraal.

Visual Sensitivity

Given that the rural character of the development site and surroundings is largely intact, the area would potentially be sensitive to new industrial type elements in the landscape, such as wind turbines, substations and power lines.

The area surrounding the proposed development site is a sparsely populated sheep farming district, although some of these include guest farms. The proposed WEF would not be visible or only marginally visible from the largest settlement, Murraysburg, about 21 km to the south-west. A number of farmsteads in the surroundings range from just over a kilometre to more than 30 km distance from the proposed WEF.

Besides the farmsteads the area is mainly viewed by residents and visitors from the R63 Provincial Road and a number of district roads, which can be perceived as view corridors.

Visually sensitive landscape or scenic resources are indicated on Figure 8.8 These include prominent topographic features in the area, particularly mountain peaks, ridgelines, scarps and steep slopes. Perennial and seasonal water courses also have scenic value in a dry and fairly uniform landscape.

Potential visibility of the proposed Umsinde Emoyeni WEF from selected viewpoints is given in the table below, and in the photographic montages (Figures 8.9 – 8.13). The scattered nature of the farmsteads and settlements result in a wide range of visibility ratings.

Table 8 Potential Visibility

View-point	Location	Coordinates	Distance	Phase	Visibility
VP1	Essex	32.0262S, 24.1343E	19.11km	1	Not Visible
VP2	Marino	32.0008S, 24.0994E	14.30km	1	Not Visible
VP3	Poortjie	31.9825S, 24.0600E	10.87km	1	Moderate
VP4	Witteklip	31.9014S, 24.0702E	2.48km	1	High
VP5	Rhenosterfontein	31.7482S, 24.0921E	6.01km	2	Moderate
VP6	Avontuur	31.6701S, 24.0614E	10.20km	2	Not Visible
VP7	Philipskraal	31.7712S, 24.0484E	1.26km	2	High
VP8	Vleiplaats	31.9818S, 23.8395E	19.94km	1	Marginal
VP9	Badsfontein gate	31.8016S, 23.7373E	16.77km	2	Marginal
VP10	Badsfontein opstal	31.7935S, 23.7433E	16.21km	2	Marginal
VP11	Badsfontein dam	31.7949S, 23.7455E	15.92km	2	Moderate
VP12	Elandspoort	31.6164S, 23.7734E	26.70km	2	Not Visible

VP13	Ratelfontein ridge	31.6162S, 23.6745E	33.94km	2	Not Visible
VP14	Ratelfontein east	31.6269S, 23.6833E	32.28km	2	Marginal
VP15	Ratelfontein saddle	31.6262S, 23.6769E	32.88km	2	Marginal
VP16	Rooisandheuwel	31.6885S, 23.7959E	17.69km	2	Marginal
VP17	Snyderskraal	31.8500S, 23.7432E	16.42km	2	Marginal
VP18	Brookfield	31.8882S, 23.7233E	20.07km	2	Marginal
VP19	Murraysburg town	31.9627S, 23.7711E	21.43km	2	Not Visible
VP20	Brandkraal	31.9638S, 23.7406E	23.84km	2	Marginal

Visual Exposure

Visual exposure is determined by the viewshed, being the geographic area within which the project would be visible, the boundary tending to follow ridgelines and high points in the landscape. Some areas within the viewshed fall within a view shadow, and would therefore not be affected by the proposed energy facilities. Viewsheds have been prepared for each of the 2 phases of the WEF and for the grid connection corridor. The viewsheds indicate potentially less visual exposure to the east because of a line of ridges.

Visual Sensitivity

Visual sensitivity is determined by topographic features, steep slopes, rivers, scenic routes, cultural landscapes, and tourist facilities such as guest farms.

Landscape Integrity

Visual quality is enhanced by the scenic or rural quality and intactness of the landscape, as well as lack of other visual intrusions. The Karoo landscape of the study area is at present generally intact with few visual intrusions. The proposed WEF therefore has potential significance in terms of altering the rural landscape.

Cultural Landscape

Besides natural attributes, landscapes have a cultural value, enhanced by the presence of palaeontological and archaeological sites, historical settlements, farmsteads and cultivated lands. The mapping of these would be informed by the heritage specialist study.

Visual Absorption Capacity

This is the potential of the landscape to screen the project. The study area has a few ridges and koppies, which will tend to have a screening effect at the broader scale, but is otherwise relatively open and visually exposed in terms of the more immediate surroundings, and therefore locally has a relatively low visual absorption capacity.

8.10 NOISE

Ambient (background) noise levels were previously measured at other locations within 150 km of the proposed development, indicating an area with a sound level character typical of a rural area (away from dwellings, plantations, roads and towns), during periods when wind speeds were below 3 m/s. These measurements were considered applicable, as the topography, vegetation and meteorological conditions are similar.

Ambient sound levels were measured at two locations for two night-time periods during July 2014 using two class-1 Sound Level Meters as well as a portable weather station (Figure 8.14). The sound level meters would measure "average" sound levels over 10 minutes periods, save the data and start with a new 10 minute measurement until the instrument was stopped. While the area has a rural character in terms of appearance and development, sound levels measured in the area determined ambient sound levels higher than expected.

Measured data indicated daytime ambient sound levels typical of a rural noise district with night-time levels indicating an urban noise district. The higher than expected ambient sound levels are likely due to increased wind speeds during the period that measurements were collected, as most measurements illustrate a spectral character typical of wind-induced noises from vegetation and wind.

As most of the area were considered naturally quiet, it was selected to assign an acceptable noise rating level of a rural noise district (as per SANS 10103:2008).

Wind induced noises are normally seen as unwanted noises, with measurements reflecting acoustic interference (due to wind induced noises) normally discarded. However, for the purpose of this study it will be included, as the typical operating noise of the wind energy facility will only be emitted during times when wind induced noise levels are relevant. Site-specific measurements were conducted during the EIA phase.

8.10.1 Measurement Point UEASL01 - (NSD08)

This measurement location was situated in an open field approximately 30 meters from the house. The sounds from the house were not audible and the location represents the typical natural sound levels of the area.

While more than 5m away from the nearby vegetation, large conifers were located in the area and created a constant soft noise (susurration) as the wind blew through the needles. Other sounds that were noted, included bird and insect sounds (soft and infrequent), although the wind induced noises dominated consistently.

Measured $L_{Aeq,i}$ day/night-time data: During the daytime $L_{Aeq,i}$ values ranged from 21.9 to 59.9 dBA. The night-time $L_{Aeq,i}$ values (night-time reference period 22:00 – 06:00) ranged from 26.1 to 55.2 dBA. The daytime mathematical average was 45.8 dBA while night-time average was 44.2 dBA. The equivalent daytime sound levels ("average" value over 16 hours) were 46 (afternoon only), 52.2 and 46 (morning only) dBA. The equivalent night-time sound levels ("average" value over 8 hours) were 43.4 and 50.2 dBA. Measured data indicated an area that is relative quiet with natural sounds and wind induced noises impacting on most measurements.

Measured $L_{Aeq,f}$ day/night-time data: During the daytime $L_{Aeq,f}$ values ranged from 20.3 to 56.8 dBA. The night-time $L_{Aeq,f}$ values (night-time reference period 22:00 – 06:00) ranged from 24.9 to 54.8 dBA. The daytime average was 44 dBA while the night-time average was 43 dBA. The equivalent daytime sound levels were 45 (afternoon), 51 and 42 (morning) dBA. Night-time equivalent sound levels were 43 and 50 dBA.

Measured 10-minute $L_{A90,f}$ day/night-time data: L_{A90} is a statistical indicator that describes the noise level that is exceeded 90% of the time and frequently used to define the background sound level. Daytime values ranged from 19 to 54 dBA90 averaging at 38.7 dBA90. The night-time L_{A90} values ranged from 21 to 51 dBA90 (night-time reference period 22:00 – 06:00) averaging at 40 dBA90. Measured L_{A90} data also confirm an area that is generally quiet.

$L_{Aeq,i}$ - $L_{Aeq,f}$ average difference, day/night-time: The average daytime difference between the $L_{Aeq,i}$ and $L_{Aeq,f}$ variables was 1.8 dBA while the night-time average difference was 0.8 dBA. There are therefore very little impulsive noises in the area.

L_{Amax} night-time occurrences: There was only one noise event during the two night-time periods where the sound level exceeded 65 dBA. Night-time maximum noise events may affect sleeping patterns in humans.[18]

[18] World Health Organization, 2009, '*Night Noise Guidelines for Europe.*

Third octave spectral analysis:

Lower frequency (20 – 250 Hz) – Noise sources of significance in this frequency band would include nature (wind especially) and sounds of anthropogenic origin (such as electric motors) and vehicles (engine revolutions). Lower frequencies tend to travel further through the atmosphere than higher frequencies. As with most of the measurements, the measurements reflect significant acoustic energy in these frequency bands. The smoother curves generally relate to higher wind speeds, where sound from the wind could mask the other noises that may be present.

Third octave surrounding the 1000 Hz – This range contains energy mostly associated with human speech (350 Hz – 2,000 Hz; mostly below 1,000 Hz) and dwelling noises (including sounds from larger animals such as cattle, dogs, goats and sheep). While acoustic energy due to wind-induced noise dominates, a few measurements indicate noises from different sources, typical of a rural area. It should be noted that the wind induced noises could also mask other noises in this frequency band.

Higher frequency (2,000 Hz upwards) – Smaller faunal species such as birds, crickets and cicada use this range to communicate and hunt etc. Measurements however indicated very noise sounds in these frequency ranges during the measurement period, likely due to the winter season.

Spectral data analysis concludes that the area has few anthropogenic activities impacting on ambient sound levels with wind-induced noises dominating the ambient soundscape. While elevated sound levels were measured the site can be considered naturally quiet.

SANS 10103 Rating Level: While the area has a rural development character, ambient sound level measurements indicated an area where wind-induced and insect sounds raised the ambient sound levels significantly, more typical of an urban district. The character of these noises however is very different from urban areas with sounds from natural origin mainly dominating.

8.10.2 Measurement point UEASL02 – (NSD12)

The measurement location is at an open area approximately 20 meters from the house of the owner. There was an unused chicken pen close to the measurement location. There was no vegetation close to the microphone, although there were large eucalyptus trees close to the house.

Measured $L_{Aeq,i}$ day/night-time data: During the daytime $L_{Aeq,i}$ values ranged from 33.4 to 60.3 dBA. The night-time $L_{Aeq,i}$ values (night-time reference period 22:00 – 06:00) ranged from 27 to 49.3 dBA. The daytime mathematical average was 45.3 dBA while night-time average was 41.5 dBA. The equivalent daytime sound levels ("average" value over 16 hours) were 47 (afternoon), 49 and 46 (morning) dBA. The equivalent night-time sound levels ("average" value over 8 hours) were 42 and 45 dBA. Measured data indicated an area with elevated sound levels.

Measured $L_{Aeq,f}$ day/night-time data: During the daytime $L_{Aeq,f}$ values ranged from 30 to 56 dBA. The night-time $L_{Aeq,f}$ values (night-time reference period 22:00 – 06:00) ranged from 26 to 48.5 dBA. The daytime mathematical average was 43 dBA while night-time average was 40.5 dBA. The equivalent daytime sound levels ("average" value over 16 hours) were 44 (afternoon), 45 and 40 (morning) dBA. The equivalent night-time sound levels ("average" value over 8 hours) were 42 and 44 dBA.

$L_{Aeq,i}$ - $L_{Aeq,f}$ average difference, day/night-time: The average daytime difference between the $L_{Aeq,i}$ and $L_{Aeq,f}$ variables was 2.2 dB while the night-time was 1 dB. There are therefore very little impulsive noises in the area.

Measured 10-minute $L_{A90,f}$ day/night-time data: L_{A90} is a statistical indicator that describes the noise level that is exceeded 90 % of the time and frequently used to define the background sound level. Daytime values ranged from 22 to 48 dBA90 averaging at 38 dBA90. The night-time L_{A90} values ranged from 20 to 45 dBA90 (night-time reference period 22:00 – 06:00) averaging at 31.9 dBA90. Measured L_{A90} data indicate a noisy area.

L_{Amax} night-time occurrences: There were no instances where the sound level exceeded 65 dBA at night. Most people, when exposed to 10 or morenoisy events where the maximum sound level exceeds 65 dBA may experience disturbances in sleeping patterns.[19]

Third octave spectral analysis:

Lower frequency (20 – 250 Hz) – As with UEASL01, wind induced noises mainly dominated the low frequency bands.

Third octave surrounding the 1000 Hz band – Wind induced noises did dominate this frequency band, with only a few measurements showing sounds from either animals or people close to the microphone.

Higher frequency (2,000 Hz upwards) – Nothing.

Spectral data analysis concludes that the area has few anthropogenic activities impacting on ambient sound levels with wind-induced noises dominating the ambient soundscape.

Ambient Sound Levels – Summary

Considering the results of the ambient sound measurements, the main source of sound was from wind-induced noises. These sounds were prominent during both the day- and night-time periods. While the sound levels were slightly elevated the area is naturally quiet and the SANS 10103 rating levels are typical of a rural noise district.

9 IMPACT IDENTIFICATION AND ASSESSMENT

This chapter summarises the identified potential impacts of the proposed WEF Phase 2. It also includes details on sensitivity mapping conducted during the EIA process, which informed the design process of the proposed development.

9.1 Geology, Soils and Agriculture

9.1.1 Impact Identification

The table below lists the anticipated activities for the site. The last two columns in the table list the anticipated forms of soil degradation and geographical distribution of the impacts.

Table 9 List of activities and their associated forms of soil degradation

Activity	Form of Degradation	Geographical Extent
Construction Phase		
Construction of turbines (foundations)	Physical degradation (compound)	Two dimensional
Construction of buildings and other infrastructure	Physical degradation (compound)	Two dimensional
Construction of roads	Physical degradation (compound)	Two dimensional
Construction of power lines	Physical degradation (compound)	Two dimensional
Construction and Operational Phase Related Effects		

[19] World Health Organization, 2009, '*Night Noise Guidelines for Europe.*

Activity	Form of Degradation	Geographical Extent
Vehicle operation on site	Physical and chemical degradation (hydrocarbon spills)	Mainly point and one dimensional
Dust generation	Physical degradation	Two dimensional

9.1.2 Impact Assessment and Mitigation Measures

During the construction phase, the main impact will be the disturbance of soils and existing land use, based on the activities described above.

Impact of the development on agricultural potential and land capability

Impact	Consequence	Probability	Significance	Status	Confidence
Impact 1: Turbine footprint construction	Low	Definite	Low	- ve	High
With Mitigation	Low	Definite	LOW	- ve	High
Impact 2: Construction of buildings and infrastructure	Low	Definite	Low	- ve	High
With Mitigation	Low	Definite	LOW	- ve	High
Impact 3: Construction of roads	Low	Definite	Low	- ve	High
With Mitigation	Low	Definite	LOW	- ve	High
Impact 4: Vehicle operation and spillages	Very Low	Definite	Low	- ve	High
With Mitigation	Very Low	Improbable	INSIGNIFICANT	- ve	High
Impact 5: Dust generation	Low	Definite	Low	- ve	High
With Mitigation	Very Low	Improbable	INSIGNIFICANT	- ve	High

9.1.3 Mitigation Measures

- Limit footprint to the immediate development area;
- Keep to existing roads as far as possible;
- Maintain vehicles, prevent and address spillages; and
- Limit vehicle movement to absolute minimum, construct proper roads for access.

9.2 Flora and Fauna

9.2.1 Impact Identification

9.2.1.1 Construction Phase

Impacts on vegetation and protected plant species

Site clearing for roads, turbines and other infrastructure would result in the loss of currently intact vegetation. This may include protected and red-listed plant species as well as their habitats. This impact is highly likely to occur in all areas where development takes place.

Alien Plant Invasion Risk

The large amount of disturbance created during construction will leave the site vulnerable to alien plant invasion. Although, this impact is generated during construction, it is only expressed during operation and is therefore assessed for the operational phase and not for construction. Some invasion of short lived weedy species may occur during construction; however, their control would occur largely during the operational phase after the completion of the site.

Increased erosion risk

Increased erosion risk would result from soil disturbance and the loss of plant cover within cleared and disturbed areas. The site is topographically diverse and includes quite a lot of steep areas that would be vulnerable to erosion impact. There are also a lot of drainage lines present that would be disturbed by the construction of the facility and the risk of erosion problems would therefore be high. As the larger rivers at the site are considered Priority Rivers under the NFEPA, erosion leading to impact on the riverine ecosystems would be highly undesirable.

Due to the extensive disturbance likely to be created by construction within the facility, this impact is most likely to occur within the facility, but could potentially occur along the power line route as well if suitable avoidance and mitigation measures were not implemented during construction.

Direct Faunal impacts

Increased levels of noise, pollution, disturbance and human presence will be detrimental to fauna. Sensitive and shy fauna would move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the construction activities and might be killed. Some mammals and reptiles such as tortoises would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present. There are also some mammals of conservation concern which occur in the area and impacts on these species would be undesirable. Some habitat loss for these species is likely to occur, but would not be of high significance given the scale of the development relative to the distribution extent of these species.

In terms of impacts on amphibians, the large number of river crossings is a concern as disturbance leading to erosion and silt input are a threat to amphibians on the site. Many of the drainage lines are currently little impacted by direct human influences and the large amount of disturbance at the site during construction would certainly be likely to lead to a decline in water quality in the area due to increased turbidity and potentially pollution as well. With the appropriate mitigation and avoidance, impact to drainage systems, erosion and hence impact on amphibians can be kept to a minimum and in the long-term impacts on amphibians are likely to be low.

9.2.1.2 Operational Phase

Alien Plant Invasion Risk

The large amount of disturbance created during construction will leave the site vulnerable to alien plant invasion. This would be a particular concern if it resulted in the spread of large woody species such as *Prosopis* which can have ecosystem-level consequences for hydrology as well as biodiversity and the delivery of ecosystem services.

This impact is likely to occur where extensive or recurrent disturbance takes place and as such is most likely to occur within the facility. Disturbance along the power line would be limited and of much shorter duration. As such this impact is likely to be a significant problem only within the facility and is not considered a likely impact associated with the power line corridor.

Increased erosion risk

Increased erosion risk would result from soil disturbance and the loss of plant cover within cleared and disturbed areas. The site is topographically diverse and includes quite a lot of steep areas that would be vulnerable to erosion impact. There are also a lot of drainage lines present that would be disturbed by the construction of the facility and the risk of erosion problems would therefore be high. As the larger rivers at the site are considered Priority Rivers under the NFEPA, erosion leading to impact on the riverine ecosystems would be highly undesirable. This impact is likely to be initiated during construction, but the risk is likely to persist into the operational phase and it is likely that long-term erosion monitoring and control at the site would be necessary.

Due to the extensive disturbance likely to be created by construction within the facility, this impact is most likely to occur within the facility, but could potentially occur along the power line route as well if suitable avoidance and mitigation measures were not implemented during construction.

Direct Faunal impacts

Increased levels of noise, disturbance and human presence during operation may be detrimental to fauna. Noise generated by the turbines may have some impact on sensitive fauna, while other species may avoid the area on account of the increased levels of activity in the area. Many species would however become habituated to the turbines and would return to normal activity after some time. Direct faunal impacts during operation are likely to be limited to the facility and significant interaction is not expected along the power line corridor. Faunal impacts during operation are possible within the facility, but unlikely along the power line corridor due to the low activity and limited scope for interaction of the infrastructure with fauna.

Loss of landscape connectivity and disruption of broad-scale ecological processes

The presence of the facility and associated infrastructure could potentially contribute to the disruption of broad-scale ecological processes such as dispersal, migration or the ability of fauna to respond to fluctuations in climate or other conditions. Many fauna avoid crossing open areas or are vulnerable to predation when doing so and so the extensive road network which would be required for the facility would contribute to this impact on a long-term cumulative basis. This impact is considered significant only for the facility and it is highly unlikely that the power line corridor would contribute significantly to this impact.

Some concern was raised during the scoping phase of the development around the potential impact of the development on predator distribution at the site and the potential for predators to move out of the development area and into the wider area. This was partly based on a premise that the wind farm development may deter natural prey species from the area and secondly that predators themselves would move out of the area due to the wind turbines. During the construction phase, there will be a lot of noise and disturbance at the site and it is reasonable to expect that some movement of sensitive faunal species out of the affected area will occur. However, many species such as small mammals, hares, dassies and small antelope are likely to remain in the area and as these are the dominant prey species, it is not likely that prey abundance will decline significantly. In the operational phase there is no evidence that turbines scare animals away, which usually quickly become habituated to their presence. In addition, turbines may attract some predators which learn that there may be dead birds and bats beneath the turbines and a variety of studies have shown that such carcasses are quickly removed by predators, which is often a confounding factor in bird and bat mortality studies. Therefore, any impacts on predator-prey dynamics are likely to occur during the construction phase and would be transient and in the long-term predator prey dynamics in the area is unlikely to be affected and the wind farm site would not be source area for predators more than is currently the case. Any changes to the management of the area or changes in livestock and predator management would have an overwhelming influence compared to any potential impact of the development infrastructure itself.

9.2.1.3 Decommissioning Phase

Alien Plant Invasion Risk

The large amount of disturbance created during decommissioning will leave the site vulnerable to alien plant invasion. This would be a particular concern if it resulted in the spread of large woody species such as *Prosopis* which could have ecosystem-level consequences for hydrology as well as biodiversity and the delivery of ecosystem services. This impact is likely within the facility, and unlikely along the power line corridor.

Increased erosion risk

Increased erosion risk would result from soil disturbance and the loss of plant cover within disturbed areas. The site is topographically diverse and includes quite a lot of steep areas that would be vulnerable to erosion impact. As the larger rivers at the site are considered Priority Rivers under the NFEPA, erosion leading to impact on the riverine ecosystems would be highly undesirable. This risk would be restricted to the facility and is not considered likely along the power line route or substation.

9.2.2 Impact Assessment and Mitigation Measures

9.2.2.1 Planning, Design and Construction Phase

Impacts on vegetation and listed or protected plant species resulting from construction activities

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without Mitigation	Local 1	High 3	Long-term 3	High 7	Probable	High	– ve	High
Essential mitigation measures: • Preconstruction walk-through of the facility in order to locate species of conservation concern that can be avoided or translocated as well as comply with the provincial permit conditions. • Vegetation clearing to commence only after walk through has been conducted and necessary permits obtained. • Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc. • ECO to provide supervision and oversight of vegetation clearing activities within sensitive areas such as near drainage areas. • Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared. • All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area. • Temporary lay-down areas should be located within previously transformed areas or areas that have been identified as being of low sensitivity. These areas should be rehabilitated after use.								
With Mitigation	Local 1	Medium 2	Long-term 3	Medium 6	Probable	MEDIUM	– ve	High

Alien Plant Invasion Risk

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without Mitigation	Local 1	Medium 2	Long-term 2	Low 5	Probable	Low	– ve	High
Essential mitigation measures: • Wherever excavation is necessary, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species. • The recovery of the indigenous grass layer should be encouraged through leaving some areas intact through the construction phase to create a seed source for adjacent cleared areas. • Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. • Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as there are also likely to be prone to invasion problems. • Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.								
With Mitigation	Local 1	Medium 2	Short-term 1	Very Low 4	Probable	LOW	– ve	High

Increased Erosion Risk

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without Mitigation	Local 1	Medium 2	Long-term 3	Medium 6	Probable	Medium	– ve	High
Essential mitigation measures: • Dust suppression and erosion management should be an integrated component of the construction approach. • Disturbance near to drainage lines or the pan should be avoided and sensitive drainage areas near to the construction activities should demarcated as no-go areas. • Regular monitoring for erosion problems along the access roads and other cleared areas. • Erosion problems should be rectified on a regular basis. • Sediment traps may be necessary to prevent erosion and soil movement if there are topsoil or other waste heaps present during the wet season. • A low cover of vegetation should be left wherever possible within the construction footprint to bind the soil, prevent erosion and promote post-disturbance recovery of an indigenous ground cover.								
With Mitigation	Local 1	Low 1	Med-term 2	V Low 4	Probable	VERY LOW	– ve	High

Direct Faunal Impacts

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without Mitigation	Local 1	High 3	Medium 2	Medium 6	Probable	Medium	– ve	High
Essential mitigation measures: • All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often persecuted out of superstition. • Any fauna threatened by the construction activities should be removed to safety by the ECO or appropriately qualified environmental officer. • All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises. • All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. • If trenches need to be dug for water pipelines or electrical cabling, these should not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches which are standing open should have places where there are soil ramps allowing fauna to escape the trench.								
With Mitigation	Local 1	Medium 2	Medium 2	Low 5	Probable	LOW	– ve	High

9.2.2.2 Operational Phase

Alien Plant Invasion Risk

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without Mitigation	Local 1	Medium 2	Long-term 3	Medium 6	Definite	MEDIUM	– ve	High
Essential mitigation measures: • Wherever excavation is necessary, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species. • The recovery of the indigenous shrub/grass layer should be encouraged through leaving some areas intact through the construction phase to create a seed source for adjacent cleared areas. • Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. Problem woody species such as *Prosopis* are already present in the area and are likely to increase rapidly if not controlled. • Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as there are also likely to be prone to invasion problems. • Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.								
With Mitigation	Local 1	Low 1	Long-term 3	Low 5	Probable	LOW	– ve	High

Increased Erosion Risk

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without Mitigation	Local 1	Medium 2	Long-term 3	Medium 6	Definite	Medium	– ve	High
Essential mitigation measures: • All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. • Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance. • All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. • All cleared areas should be revegetated with indigenous perennial grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.								
With Mitigation	Local 1	Low 1	Long-term 3	Low 5	Probable	LOW	– ve	High

Direct Faunal Impacts

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without Mitigation	Local 1	Medium 2	Long-term 3	Medium 6	Probable	MEDIUM	– ve	High
Essential mitigation measures: • No unauthorized persons should be allowed onto the site. • Any potentially dangerous fauna such snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location. • The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. • If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects. • All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. • All vehicles accessing the site should adhere to a low speed limit (30km/h max) to avoid collisions with susceptible species such as snakes and tortoises. • If parts of the facility are to be fenced, then no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences as they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of the fence and not the outside.								
With Mitigation	Local 1	Medium 2	Long-term 3	Medium 6	Probable	MEDIUM	– ve	High

9.2.2.3 Decommissioning Phase

Alien Plant Invasion Risk

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without Mitigation	Local 1	Medium 2	Long-term 3	Medium 6	Definite	Medium	– ve	High
Essential mitigation measures: • Rehabilitation of all cleared and disturbed areas with local species. • Post-decommissioning monitoring and control of alien species for at least 3 years after decommissioning.								
With Mitigation	Local 1	Low 1	Long-term 3	Low 5	Probable	LOW	– ve	High

Increased Erosion Risk

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without Mitigation	Local 1	Medium 2	Long-term 3	Medium 6	Definite	Medium	– ve	High
Essential mitigation measures: • Removal of all infrastructure components from the site. • Rehabilitation of all cleared and disturbed areas with local species. • Off-site disposal of all facility components such as cabling, turbine parts etc. • Monitoring programme for at least three years after decommissioning to document vegetation recovery across the site.								
With Mitigation	Local 1	Low 1	Long-term 3	Low 5	Probable	LOW	– ve	High

9.3 Wetlands and Freshwater

9.3.1 Impact Identification

The following impacts were not assessed as the factors were not present within the study area aquatic ecosystems:

- Loss of aquatic species of special concern; and
- Wetland loss as no natural wetlands were observed in close proximity to any of the proposed infrastructure (i.e. within 500 m of the roads layout).

The following direct and indirect impacts were assessed with regard to the riparian areas and water courses:

Loss of riparian systems and water courses

The physical removal of the riparian zones and disturbance of any alluvial watercourses by road crossings, being replaced by hard engineered surfaces. This biological impact would however be localised, as a large portion of the remaining catchment would remain intact. This coupled to the fact that the majority of the crossings will occur over small or minor drainage lines, while 14 of the 31 crossings (Phase 1 & 2) already exist and will thus only be upgraded.		
Reversibility	High	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	
Mitigation:		

- Where water course crossings are required, the engineering team must provide an effective means to minimise the potential upstream and downstream effects of sedimentation and erosion (erosion protection) as well minimise the loss of riparian vegetation (small footprint).   - No vehicles to refuel within drainage lines/ riparian vegetation.   - During the operational phase, monitor culverts to see if erosion issues arise and if any erosion control if required.   - Where possible culvert bases must be placed as close as possible with natural levels in mind so that these don't form additional steps / barriers.
Residual impacts: Possible impact on the remaining catchment due to changes in run-off characteristics in the development site.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	Local (L)	Long term (L)	L-	Negative	Medium (-)	High	High
With Mitigation	Local (L)	Short term (S)	L-	Negative	LOW (-)	High	High

Impact on riparian systems through the possible increase in surface water runoff on riparian form and function

	Without mitigation	With mitigation
Reversibility	High	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	
Mitigation: Any storm water within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities.		
Residual impacts: Possible impact on the remaining catchment due to changes in run-off characteristics in the development site. However due to low mean annual runoff within the region this is not anticipated due to the nature of the development together with the proposed layout.		

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	Local (L)	Long term (L)	L-	Negative	Medium (-)	High	High
With Mitigation	Local (L)	Short term (S)	L-	Negative	LOW (-)	High	High

Increase in sedimentation and erosion with the development footprint

	Without mitigation	With mitigation
Reversibility	High	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	
Mitigation: Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments and reduce flow velocities.		
Residual impacts: During flood events, any unstable banks (eroded areas) and sediment bars (sedimentation downstream) already deposited downstream. However due to low mean annual runoff within the region this is not anticipated due to the nature of the development together with the proposed layout.		

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence

Without Mitigation	Local (L)	Long term (L)	L-	Negative	Medium (-)	High	High
With Mitigation	Local (L)	Short term (S)	L-	Negative	LOW (-)	High	High

Potential impact on localised surface water quality

During both preconstruction, construction and to a limited degree the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities could be washed downslope via the ephemeral systems.		
	Without mitigation	With mitigation
Reversibility	Yes (high)	Yes (high)
Irreplaceable loss of resources	Yes (medium)	Yes (low)
Can impacts be mitigated	Yes (high)	

Mitigation:

- Strict use and management of all hazardous materials used on site.
- Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.).
- Containment of all contaminated water by means of careful run-off management on the development site.
- Strict control over the behaviour of construction workers.
- Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Construction Environmental Management Plan (CEMP) for the project and strictly enforced.
- Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility.

Residual impacts:

Residual impacts will be negligible after appropriate mitigation.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	Local (L)	Long term (L)	L-	Negative	Medium (-)	High	High
With Mitigation	Local (L)	Short term (S)	L-	Negative	LOW (-)	High	High

9.4 Avifauna

9.4.1 *Identification of Impacts*

9.4.1.1 *Construction Phase*

Habitat destruction

During the construction of WEF infrastructure, some habitat destruction and alteration takes place. This happens with the construction of access roads, the clearing of servitudes and the levelling of substation yards, development of laydown areas and turbine bases. The extent of the impact is local and confined to the WEF site.

This habitat destruction is temporary in the case of, for example construction offices and laydown areas, or will last for the duration of the project, in the case of turbine foundations and substation compounds. The removal of vegetation which provides habitat for avifauna and food sources may have an impact on birds breeding, foraging and roosting. The impact can be permanent (long-term) if no rehabilitation takes place, following the decommissioning of the development, but will be for most part of long-term duration until the decommissioning of the facility.

The scale of direct habitat loss resulting from the construction of a wind farm and associated infrastructure depends on the size of the project but, generally speaking, is likely to be small per turbine base. Typically, actual habitat loss amounts to 2 – 5 % of the total development area (Drewitt & Langston 2006) of a WEF and is unlikely to be significant, unless a particularly scarce or important habitat was affected, which is not expected at the WEF site. The intensity of habitat destruction is therefore considered to be of potentially medium intensity. WEF Phase 1 covers a smaller area than WEF Phase 2 so the intensity will be slightly higher for Phase 2, but is still considered medium. The probability of habitat destruction occurring is definite and the impact will be negative.

Disturbance & Displacement

Disturbances and noise from staff and construction activities can impact on the various sensitive species occurring on site, particularly whilst feeding and breeding, resulting in effective habitat loss through a perceived increase in predation risk (Frid & Dill 2002; Percival 2005). There are various such sensitive species occurring on the WEF site including Ludwig's Bustard, Karoo Korhaan, Northern Black Korhaan, Verreaux's Eagle and Blue Crane. This can cause these species being displaced, either temporarily (i.e. for some period during the construction activity) or permanently (i.e. they do not return), into less suitable habitat which may reduce their ability to survive and reproduce. Overall, it is expected that the majority of displacement will be of a medium duration (2 - 15 years). The extent of this impact will be local and restricted to the WEF site and access roads and is considered to be of medium intensity. The probability of some displacement occurring is considered definite during the busy construction period, resulting in a low significance of this impact.

With implementation of all mitigation measures the intensity of the impact can be reduced to low, resulting in a very low significance.

9.4.1.2 Operational Phase

Disturbance and Displacement

During the operation and maintenance of the WEF (including the normal operation of the turbines themselves) a certain amount of disturbance results. An operational WEF will normally have various day to day activities occurring on site, such as (but not limited to) security control, routine maintenance, road clearing/cleaning, grass/bush cutting and clearing.

These factors can all lead to birds avoiding the area for feeding or breeding, and effectively leading to habitat loss and a potential reduction in breeding success (Larsen & Madsen 2000; Percival 2005). Turbines can also be disruptive to bird flight paths, with some species altering their routes to avoid them (Dirksen *et al.* 1998, Tulp *et al.* 1999, Pettersson & Stalin 2003). While this reduces the chance of collisions it can also create a displacement or barrier effect, for example between roosting and feeding grounds and result in an increased energy expenditure and lower breeding success (Percival 2005). This could potentially occur for any waterbirds regularly utilising one of the larger dams on either side of the WEF site for foraging but roosting on the other side of the turbines (or vice versa).

Disturbance distances (the distance from wind farms up to which birds are absent or less abundant than expected) can vary between species and also within species with alternative habitat availability (Drewitt & Langston 2006). Some studies have recorded distances of 80 m, 100 m, 200 m and 300 m (Larsen & Madsen 2000, Shaffer & Buhl 2015) but distances of 600 m (Kruckenberg & Jaehne 2006) and up to 800 m have been recorded (Drewitt & Langston 2006).

Raptors are generally fairly tolerant of wind farms, and continue to use the area for foraging (Thelander *et al.* 2003, Madders & Whitfield 2006), so are not affected by displacement, which however increases their collision risk.

It is expected that some species potentially occurring on the WEF site will be susceptible to displacement, for example smaller passerines such as larks, coursers and large terrestrial red data species such as Karoo Korhaan and Ludwig's Bustard. The extent of the impact will be local and restricted to the WEF site. As some species may not return the duration is potentially long-term. For both phases, separately, the intensity is considered potentially medium and probable to occur, resulting in a medium significance. With implementation of the mitigation measures the intensity can be lowered resulting in a low significance.

Electrocution

Electrocution of birds from electrical infrastructure including overhead lines is an important and well documented cause of unnatural bird mortality, especially raptors and storks (APLIC 1994; van Rooyen and Ledger 1999). Electrocution may also occur within newly constructed substations. Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (van Rooyen 2004). Electrocutions are therefore more likely for larger species whose wingspan is able to bridge the gap such as eagles or storks. Various large raptors (such as Martial Eagle, Verreaux's Eagle and African Fish-Eagle), susceptible to electrocution (particularly in the absence of safe and mitigated structures) occur on the WEF site.

The extent of the impact is local and restricted to the WEF and grid connection areas. As the result of the impact is mortality the intensity is considered high and the duration long-term. Since electrocution is known to affect many species in South Africa the impact is probable to occur, resulting in a high significance. If all overhead lines are of a bird-friendly design the probability of electrocution occurring can be reduced to improbable, resulting in an impact of medium significance.

Power Line Collisions

Wind energy facilities may have overhead lines between turbine strings and substations and collisions of birds are possible. Collisions with overhead power lines occur when a flying bird does not see the cables, or is unable to take effective evasive action, and is killed by the impact or impact with the ground. Especially heavy-body birds such as bustards, cranes and waterbirds, with limited manoeuvrability, all of which occur on the WEF site, are susceptible to this impact (van Rooyen 2004).

Many of the collision and electrocution sensitive species are also considered threatened in southern Africa. The red data (Taylor 2015) species vulnerable to power line collisions are generally long living, slow reproducing species under natural conditions. Some require very specific conditions for breeding, resulting in very few successful breeding attempts, or breeding might be restricted to very small areas. These species have not evolved to cope with high adult mortality, with the results that consistent high adult mortality over an extensive period could have a serious effect on a population's ability to sustain itself in the long or even medium term. Species that may be affected on the WEF site include Ludwig's Bustard, Blue Crane, Karoo Korhaan, Northern Black Korhaan, Secretarybird and Greater Flamingo. Of particular concern are Ludwig's Bustard, Greater Flamingo and Blue Crane. The latter two often fly before dawn and after dusk (pers. Obs and pers. Com with BARESG), reducing their ability to see and avoid power lines. Ludwig's Bustard is known to be particularly prone to collision (pers. Com R. Simmons, J. Smallie, M. Martins and BARESG) (Shaw *et al.* 2010).

The extent of the impact is restricted to constructed power lines for the duration of their existence. As the result of this impact is mortality which may affect the viability of a population the intensity is considered high. As discussed above the impact is probable to occur and therefore its significance is high.

Wind Turbine Collisions

WEFs can have adverse impacts on avifauna through the collision of birds with moving turbine blades. A number of factors influence the number of birds impacted by collision, including:

- Number of birds in the vicinity of the WEF;
- The species of birds present and their flying patterns and behaviour;
- The design of the development including the turbine layout, height and size of the rotor swept area.

It is important to understand that not all birds that fly through the WEF at heights swept by rotors automatically collide with blades. In fact avoidance rates for certain species have proven to be extremely high. In a radar study of the movement of ducks and geese in the vicinity of an off-shore wind facility in Denmark, less than 1 % of bird flights were close enough to the turbines to be at risk, and it was clear that the birds avoided the turbines effectively (Desholm and Kahlert 2005). Whilst avoidance rates for SA species are currently unknown due to the lack of data, comparisons can be drawn between functionally similar species, for example Verreaux's Eagle with Golden Eagle, in order to inform an assessment.

The majority of studies on collisions caused by wind turbines have recorded relatively low mortality levels (Madders & Whitfield 2006). This is perhaps largely a reflection of the fact that many of the studied wind farms are located away from large concentrations of birds. It is also important to note that many records are based only on finding carcasses, with no correction for carcasses that were overlooked or removed by scavengers (Drewitt & Langston 2006). Relatively high collision mortality rates have been recorded at several large, poorly-sited wind farms in areas where large concentrations of birds are present (including IBAs), especially among migrating birds, large raptors or other large soaring species, e.g. in the Altamont Pass in California, USA (Thelander and Smallwood 2007), and in Tarifa and Navarra in Spain (Barrios and Rodrigues 2004).

Although large birds with poor manoeuvrability (such as cranes, flamingos, korhaans, bustards and Secretarybird) are generally at greater risk of collision with structures (Jenkins *et al*. 2011), it is noted that these classes of birds (unlike raptors) do not feature prominently in literature as wind turbine collision victims. It may be that they avoid wind farms, resulting in lower collision risks, or that they are not distracted and focussed on hunting and searching the ground while flying, as is the case for raptors.

Collisions of various species with turbine infrastructure (including the tower) have been observed recently in South Africa (pers. Obs). There are documented reports of three Verreaux's Eagle mortalities from collisions with operational wind turbines in May 2015 at a WEF in the Eastern Cape (Smallie 2015). The fatalities were unexpected as they occurred on relatively flat topography at considerable distance (at least 3.5 km) from suitable Verreaux's Eagle breeding habitat, and pre-construction bird monitoring by Smallie (2015) on the site recorded 'low Verreaux's Eagle flight activity'. Without seeing and analysing the detailed data collected by Smallie (2015) it's difficult to quantify what is meant by 'low activity', as this may be a relative description. It is also unknown, what, if any, mitigation measures were applied at this site. However, what is relevant is that it has been confirmed that this species collides with turbines and that collisions may not necessarily occur where predicted, and that they can occur away from areas perceived to be preferred use areas.

This information has reduced the confidence with which we assessed collision impacts based on perceived sensitivities for this species (e.g. nest sites and ridgelines in the case of Verreaux's Eagle).

Due to the high observed density of Verreaux's Eagle nests in the area mortalities could create a 'sink-hole effect', where a dead bird is replaced by another, which also collides, and so on, and in this way the impact would be able to affect the regional population.

The duration of the impact will be at least for the operational phase of the facility and the intensity of the impact is high. In terms of the Arcus avifaunal specialist's experience, the WEF site has relatively high levels of Verreaux's Eagle flight activity, and therefore collisions of this species are probable. The resulting significance of this impact is very high if unmitigated.

9.4.1.3 Decommissioning Phase

Disturbance and Displacement

It is likely that this phase would only commence after 25 years (or more) of operation. Disturbances and noise from staff and decommissioning activities can impact on certain sensitive species particularly whilst feeding and breeding, and may result in either a permanent (i.e. they are disturbed and do not return) or temporary (i.e. for some period during the decommissioning activity) displacement. Displacement can be viewed as an effective habitat loss through a perceived increase in predation risk (Frid & Dill 2002; Percival 2005). Overall the duration of this impact is considered to be medium. Displacement into less suitable habitat may reduce a species ability to survive and reproduce. Nesting birds utilising the electrical infrastructure are particularly vulnerable to disturbance impacts, especially if nests are disturbed or removed during the removal/take down of structures (e.g. pylons). Therefore the intensity of the impact is considered medium. Even though some disturbance will definitely occur if not mitigated the resulting significance is low.

9.4.2 Impact Assessment and Mitigation Measures

WEF Phase 2 Construction Phase: Impact Assessment for Habitat Destruction

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigation	Local 1	Medium 2	Long-term 3	Medium 6	Definite	Medium	Negative	High

Essential mitigation measures:

- Prior to construction, the avifaunal specialist must conduct a site walkthrough, covering the final road and power line routes as well as the final turbine positions, to identify any nests/breeding activity of sensitive species, as well as any additional sensitive habitats. The results of which may inform the final construction schedule, including abbreviating construction time, scheduling activities around avian breeding and/or movement of schedules, and lowering levels of associated noise.
- A site specific Construction Environmental Management Plan (CEMP) must be implemented, which gives appropriate and detailed description of how construction activities must be conducted to reduce unnecessary destruction of habitat. All contractors are to adhere to the CEMP and should apply good environmental practice during construction.

• During construction laydown areas and temporary access roads should be kept to a minimum in order to limit direct vegetation loss and habitat fragmentation, while designated no-go areas must be enforced i.e. no off road driving. • Any clearing of stands of alien trees on site should be approved first by an avifaunal specialist. • Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and to this end a habitat restoration plan is to be developed by a specialist and included within the Construction Environmental Management Plan (CEMP).								
With mitigation	Local 1	Low 1	Long-term 3	Low 5	Definite	LOW	Negative	High

With properly implemented mitigation measures as detailed in the table above the intensity of habitat destruction can be decreased to low. The residual significance of the impact will therefore be reduced to low after mitigation.

WEF Phase 2 Construction Phase: Impact Assessment for Disturbance and Displacement

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigation	Local 1	Medium 2	Medium 2	Low 5	Definite	Low	Negative	High
Essential mitigation measures: • Prior to construction, the avifaunal specialist must conduct a site walkthrough, covering the final road and power line routes as well as the final turbine positions, to identify any nests/breeding activity of sensitive species, as well as any additional sensitive habitats. The results of this must inform the final construction schedule, including possibly abbreviating construction time, scheduling activities around avian breeding and/or movement schedules, and lowering levels of associated noise. • A site specific Construction Environmental Management Plan (CEMP) must be implemented, which gives appropriate and detailed description of how construction activities must be conducted to reduce unnecessary destruction of habitat. All contractors are to adhere to the CEMP and should apply good environmental practice during construction. • The appointed Environmental Control Officer (ECO) must be trained by the avifaunal specialist to identify the potential priority species and red data species as well as the signs that indicate possible breeding by these species. The ECO must then, during audits/site visits, make a concerted effort to look out for such breeding activities of red data species, and such efforts may include the training of construction staff (e.g. in Toolbox talks) to identify red data species, followed by regular questioning of staff as to the regular whereabouts on site of these species. If any of the red data species are confirmed to be breeding (e.g. if a nest site is found), construction activities within 1 km of the breeding site must cease, and the avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed. • An avifaunal specialist must conduct nest searches of all suitable cliffs and/or tree nesting sites within 1 km of the Phase 1 and Phase 2 WEFs footprints that were not surveyed as part of the pre-construction cliff surveys. This additional survey must preferably be prior to construction commencement or as soon as possible thereafter. The aim will be to locate nest sites, so that these may continue to be monitored during the construction and operation phase, along with the monitoring of already identified nest sites. • Appoint a specialist to design and conduct monitoring of the breeding of Verreaux's Eagle and Martial Eagle at all identified nest sites that are within 5 km of a turbine position. This should be done at least three times during a calendar year during construction, optimally spaced before, during and after the breeding season of large eagles. Where possible, this monitoring can be combined with the additional nest surveys described above.								
With mitigation	Local 1	Low 1	Medium 2	Very low 4	Definite	VERY LOW	Negative	High

WEF Phase 2 Operational Phase: Impact Assessment for Disturbance and Displacement

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigation	Local 1	Medium 2	Long-term 3	Medium 6	Probable	Medium	Negative	High
Essential mitigation measures: • A site specific Operational Environmental Management Plan (OEMP) must be implemented, which gives appropriate and detailed description of how operational and maintenance activities must be conducted to reduce unnecessary disturbance. All contractors are to adhere to the OEMP and should apply good environmental practice during all operations. • The on-site WEF manager (or a suitably appointed Environmental Manager) must be trained by the avifaunal specialist to identify the potential priority species and Red Data species as well as the signs that indicate possibly breeding by these species. If a priority species or Red Data species is found to be breeding (e.g. a nest site is located) on the operational Wind Farm, the nest/breeding site must not be disturbed and the avifaunal specialist must be contacted for further instruction.								
With mitigation	Local 1	Low 1	Long-term 3	Low 5	Probable	LOW	Negative	High

WEF Phase 2 Operational Phase: Impact Assessment for Electrocution

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigation	Local 1	High 3	Long-term 3	High 7	Probable	High	Negative	High
Essential mitigation measures: • Any overhead power lines must be of a design that minimizes electrocution risk by using adequately insulated 'bird friendly' monopole structures, with clearances between live components of 2 m or greater.								
With mitigation	Local 1	High 3	Long-term 3	High 7	Improbable	MEDIUM	Negative	High

WEF Phase 2 Operational Phase: Impact Assessment for Power Line Collisions

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigation	Local 1	High 3	Long-term 3	High 7	Probable	High	Negative	High
Essential mitigation measures: • Construct new power lines close to existing power lines where possible. • An avifaunal specialist must conduct a site walk through of all above ground power line routings (both on the WEF site and the Grid Connection) prior to construction to determine if, and where, bird flight diverters (BFDs) are required. • Install bird flight diverters as per the instructions of the specialist following the site walkthrough. • Develop and implement a carcass search programme for birds during the first two years of operation, in line with the South African monitoring guidelines (Jenkins *et al.* 2015). This program must include monitoring of overhead power lines.								
With mitigation	Local 1	High 3	Long-term 3	High 7	Possible	MEDIUM	Negative	High

The mitigation measures detailed in the table above can lower the probability of the impact occurring, thus lowering the significance to medium.

WEF Phase 2 Operational Phase: Impact Assessment for Wind Turbine Collisions

	Extent	Intensity	Duration	Consequenc	Probability	Significance	Status	Confidence
Without mitigation	Regional 2	High 3	Long-term 3	Very High	Probable	Very high	Negative	Medium
Essential mitigation measures: • Turbines must not be constructed within any of the nest site buffers identified in Figure 9.6. • The hierarchy of sensitivity scores presented in the Bird Sensitivity Map (Figure 9.5) should be considered, with preferential turbine placement in areas of Low Sensitivity, and decreasing preference through to High Sensitivity areas. While not classified as no-go areas, it is recommended that placement of turbines in grid cells with a High GCSS be avoided. Where two or more sensitivity areas overlap, the layer with the higher sensitivity designation should take preference. • Develop and implement a carcass search programme for birds during the first two years of operation, in line with the South African monitoring guidelines. • Develop and implement a 12 to 24 month post-construction bird activity monitoring program that mirrors the pre-construction monitoring surveys completed by Arcus and is in line with the South African post-construction monitoring guidelines. This program must include thorough and ongoing nest searches and nest monitoring. This program should be enhanced to include sampling during dusk and dawn. • Frequent and regular review of operational phase monitoring data (activity and carcass) and results by the bird specialist. This review should also establish the requirement for continued monitoring studies (activity and carcass) throughout the operational and decommissioning phases of the development. • The above reviews should strive to identify sensitive locations at the development including turbines and areas of increased collisions with power lines that may require additional mitigation. If unacceptable impacts are observed (in the opinion of the bird specialist), the specialist should conduct a literature review specific to the impact (e.g. collision and/or electrocution) and provide updated and relevant mitigations to be implemented. • As a starting point for the review of possible mitigations, the following may need to be considered: o Assess the suitability of using deterrent devices (e.g. DT Bird and ultrasonic/radar/electromagnetic deterrents for bats) to reduce collision risk. o Identify options to modify turbine operation to reduce collision risk.								
With mitigation	Local 1	High 3	Long-term 3	High 7	Possible	MEDIUM	Negative	Low

If implemented correctly, the measures listed in the table above may result in less collisions so that the extent is reduced to local, and the probability to possible. The residual significance of wind turbine collisions for each phase separately will therefore be reduced to medium, although our confidence in this assessment is medium prior to mitigation and low with mitigation due to the lack of data on local species and their interactions with turbines and the uncertainty with regards to the effectiveness of mitigation measures, particularly for Verreaux's Eagle.

WEF Phase 2 Decommissioning Phase: Impact Assessment for Disturbance & Displacement

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigation	Local 1	Medium 2	Medium 2	Low 5	Definite	Low	Negative	High

Essential mitigation measures: • All contractors shall apply good environmental practice during decommissioning and adhere to a Decommissioning Environmental Management Plan (DEMP) which must be compiled and detail appropriate ecological measures to be taken. • Prior to decommission, consult with the avifaunal specialist who will advise if any additional relevant and updated mitigations must be implemented during this phase.								
With mitigation	Local 1	Low 1	Medium 2	Very low 4	Probable	VERY LOW	Negative	High

With implementation of mitigation measures listed the intensity of this impact can be lowered to low, and the probability reduced to probable, resulting in a very low significance for this impact.

9.5 Bats

9.5.1 Identification of Impacts

9.5.1.1 Construction Phase

Roost disturbance and/or destruction due to wind turbine, O&M building and sub-station construction

Six confirmed and 14 potential bat roosts were located at Umsinde Emoyeni WEF by NSS (2014). The roost types that were identified included house roofs and tree roosts, rock overhangs in the gorges and small caves/ overhangs in the rocky outcrops. There seemed also to be a *Miniopterus natalensis* roost very close to mast TB 13, under a large inaccessible overhang in a deep gorge in the north west of the site. Other species of bat could also be roosting in the gorge.

Disturbance to and displacement from foraging habitat due to wind turbine, O&M building and sub-station construction

Construction will involve vegetation clearance at the footprint of each turbine, hard stand area, along the road network, at the office and sub-station buildings. This causes disturbance to bat foraging habitat. General dust and noise will increase in the area which may cause more sensitive species to disperse either temporarily or permanently.

9.5.1.2 Operational Phase

Fragmentation of foraging habitat or migration routes due to the presence of the operating wind turbines and general WEF activity.

The physical infrastructure and lights and noise can act as barriers and disturbance to bats during foraging and movement.

Fatalities of Medium-High and High risk bat species due to collision or barotrauma during foraging activity, attraction to turbines and during seasonal movements or migration events.

Bats cover large distances to forage nightly (2 to more than 30km), they require large quantities of insects nightly and fly at a variety of heights to catch their prey and move around. This puts them at risk of fatality if there are operating turbines amongst their foraging lands.

Additionally, migrating bats in the USA and Europe have been shown to be at risk of fatality due to wind turbines. Whilst the migrating bats in South Africa are different species and are not tree-roosting species, the long distances that they travel and the height at which they fly also puts them at risk of fatality. SA migrating bats are cave-dwellers and also fly very long-distances (>100 km). *Miniopterus natalensis* that has been confirmed at Umsinde and most likely roosts within the study boundary area is one of these migrating species. These impacts could have far reaching consequences, not only locally, but regionally too. Isotope studies in Europe have revealed that wind farms may kill bats from populations more than 1,000km away (Voigt *et al.* 2012). Fatality of bats from potentially large geographic areas could have a devastating, long-term impact on species.

9.5.2 Impact Assessment and Mitigation Measures

9.5.2.1 Construction Phase

Roost disturbance and/or destruction due to wind turbine, O&M building and sub-station construction

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Regional 2	High 3	Short-term 1	Medium 6	Probable	Medium	– ve	High
Essential mitigation measures: • Turbine placement should only be in areas of Low-Medium and Medium bat sensitivity. No part of any turbine, including the rotor swept zone should be constructed within areas of Medium-High or High bat sensitivity. • Clearing of natural and agricultural areas be kept to a minimum. • Blasting activities not to occur within 2 km of any known bat roosts. • Dust suppression measures to be used during the full construction phase. • Any new roosts discovered, should be reported and incorporated into the adaptive management plan. Best practise mitigation measures: Roost searches to continue during construction and operational phases.								
With mitigation	Local 1	Medium 2	Short-term 1	Very Low 4	Possible	INSIGNIFICANT	– ve	High

Disturbance to and displacement from foraging habitat due to wind turbine, O&M building and sub-station construction

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Regional 2	Medium 2	Med-term 2	Medium 6	Definite	Medium	– ve	High
Essential mitigation measures: • Turbine bases, hard stand, office, sub-station and pay-down areas should only be in areas of Low-Medium and Medium bat sensitivity. • Clearing of natural and agricultural areas be kept to a minimum.								
With mitigation	Local 1	Medium 2	Med-term 2	Low 5	Definite	LOW	– ve	High

9.5.2.2 Operational Phase

Fragmentation of foraging habitat or migration routes due to the presence of the operating wind turbines and general WEF activity.

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Regional 2	Medium 2	Long-term 3	High 7	Probable	High	– ve	High
Essential mitigation measures: • Turbine placement should only be in areas of Low-Medium and Medium bat sensitivity. No part of any turbine, including the rotor swept zone should be constructed within areas of Medium-High or High bat sensitivity. • Clearing of natural and agricultural areas be kept to a minimum. • Minimize impacts to wetlands and water resources by following all applicable provisions of the National Water Act • Gaps of at least 3 turbine blade lengths are left open between turbines, from blade tip to blade tip. • Keep road, turbine and sub-station lighting to minimum. • Minimize use of high intensity lighting, steady-burning, or bright lights such as sodium vapour, quartz, halogen, or other bright spotlights. • With the exception of red aviation safety lights on lights on the turbines and meteorological masts, lights should be hooded downward and directed to minimize horizontal and skyward illumination. • All internal turbine nacelle and tower lighting should be extinguished when unoccupied.								
With mitigation	Local 1	Low 1	Long-term 3	Low 5	Probable	LOW	– ve	High

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	National 3	High 3	Long-term 3	Very High 9	Probable	Very High	– ve	High
Essential mitigation measures: Turbine placement should only be in areas of Low-Medium and Medium bat sensitivity. No part of any turbine, including the rotor swept zone should be constructed within areas of Medium-High or High bat sensitivity. Specific turbines that should be moved due to their vicinity to bat sensitive areas are: Phase 1 turbine bases that are within 70m of High sensitivity areas (identified by attribute numbers on shapefile): • 6287564 – 68 m • 6287568 – 66 m • 6287638 – 65 m Phase 1 turbine bases that are within 70m of Medium High sensitivity areas (identified by attribute numbers on shapefile): • 6287594 – within an area of Medium-High bat sensitivity. • 6287591 – 42 m Phase 2 turbine bases that are within 70m of High sensitivity areas (identified by attribute numbers on shapefile): • 6844018 – 56 m • 6844040 – 58 m • 6844011 – 65 m • 6844028 – 56 m • 6844027 – 65 m • 6843992 – 65 m • 6844009 – 67m • 6844020 – 51 m								

• 6843973 – 62 m Phase 2 turbine bases that are within 70m of Medium High sensitivity areas (identified by attribute numbers on shapefile): • 6843962 – within an area of Medium-High bat sensitivity. • 6843980 – within an area of Medium-High bat sensitivity. • 6844031 – within an area of Medium-High bat sensitivity. • 6843964 – within an area of Medium-High bat sensitivity. • 6843999 – within an area of Medium-High bat sensitivity. • 6844023 – 68 m • 6843991 – 23 m • 6843952 – 20 m Turbine engineers work with bat specialists to build in the necessary turbine adaptions needed for erecting bat detectors or deterrent devices on the turbines in the design phase, so there are no unexpected surprises or concerns after the turbines are built. For areas of Low-Medium and Medium Sensitivity With the exception of when temperatures are below 12°C: • An initial cut-in speed of 5.25 m/s (approximately 50% of bat activity occurs below this wind speed) is recommended as follows: • Not in winter. • 20h00 to 04h00 in Summer • 18h30 to 04h30 in Autumn • 19h00 to 04h00 in Spring Operational monitoring according to Aronson *et al.* (2014) or any more recent revisions to this document, reporting and adaptive management will be key to keeping the residual impact of the facility as low as possible. This data should be fed into the SANBI database to assist with enhancing the scientific knowledge base for information decision making and mitigation recommendations. Construction phase monitoring on at least one met mast in each phase commences as soon as Phase 1 construction of any sort starts. Any additional mitigation measures that arise from the monitoring and from lessons learned from Phase 1 operational monitoring, get implemented in Phase 2. Best practise mitigation measures: Pre-construction and operational monitoring bat data to feed into the SANBI bird and bat toolkit. Monthly carcass searching reports to be submitted to the SABAAP. As new information becomes available with regard to successful mitigation strategies tested, this information should feed into the adaptive management plan.								
With mitigation	Regional 2	Low 1	Long-term 3	Medium 6	Possible	LOW	– ve	High

9.6 Socio-Economic

9.6.1 Identification of Impacts

9.6.1.1 Construction Phase

Potential positive impacts

- Creation of employment and business opportunities, and the opportunity for skills development and on-site training;
- Benefits associated with providing technical advice on wind energy to local farmers and municipalities;
- Improved cell phone reception.

The construction phase for a single 140 MW WEF is expected to extend over a period of 18 - 24 months and create approximately ~ 300 employment opportunities. It is anticipated that approximately 55 % (165) of the employment opportunities will be available to low skilled workers (construction labourers, security staff etc.), 30 % (90) to semi-skilled workers (drivers, equipment operators etc.) and 15 % (45) for skilled personnel (engineers, land surveyors, project managers etc.). The construction of the second phase (additional 140 MW WEF) will not create an additional 300 new employment opportunities. Assuming that the construction of Phase 1 and 2 follow on from each other it is highly likely that the majority of the original 300 workers employed on the first phase will be employed on the next phase. For the purposes of the assessment is it assumed that 80 % (240) of the original 300 workers working on the first phase will be employed on the second phase. The total number of employment opportunities created by Phase 1 and 2 will therefore be ~ 360.

Members from the local community in the area may be in a position to qualify for the majority of the low skilled and semi-skilled employment opportunities. The levels of unemployment in the Murraysburg and the BWLM are high. The majority of these employment opportunities are also likely to accrue to Historically Disadvantaged (HD) members from Murraysburg and the BWLM. The creation of potential employment opportunities, even temporary employment, will therefore represent a significant, if localised, social benefit. However, the pool of suitably qualified local community members in Murraysburg is limited. In the absence of specific commitments by the proponent to implement a training and skills development programme prior to the commencement of the construction phase the potential opportunities for local employment are therefore likely to be low.

The total wage bill for the 18 - 24 month construction phase of a single 140 MW WEF (Phase 2) will be in the region of R 75 million (2015 Rand value). The total wage bill for Phase 1 and 2 would therefore be ~ R 150 million (2015 Rand value). A percentage of the wage bill will be spent in the local economy and will create significant opportunities for local businesses in Murraysburg, Beaufort West and Graaff Reinet. Given the high unemployment and low income levels in Murraysburg, even a small percentage of the monthly salary bill spend in the town would represent a significant opportunity. This benefit will extend over a period of ~ 4 years assuming that the construction of Phase 1 and 2 follow on from each other.

The capital expenditure associated with the construction of a 140 MW WEF (Phase 2) will be in the region of R 2.5 billion (2015 Rand value). The total combined capital expenditure for Phase 1 and 2 will therefore be ~ R 5 billion (2015 Rand value). A percentage of the capital expenditure associated with the construction phase has the potential to benefit local companies. However, the opportunities for local companies in Murraysburg will be limited. In this regard the benefits are likely to accrue to building contractors and suppliers based in towns based further afield, such as Beaufort West, Graaff Reinet and Port Elizabeth.

The sector of the local Murraysburg economy that will also benefit from the proposed development is the local service industry. This is also confirmed by the experience with the other renewable projects. The potential opportunities for the local service sector would be linked to accommodation, catering, cleaning, transport and security, etc. associated with the meeting the needs of 300 construction workers who will need to be accommodated, transported to site and fed (3 meals a day) over a period of 4 years (Phase 1 and 2). Experience for other renewable energy projects located near small towns, such as Pofadder in the Northern Cape Province, is that local residents and businesses have benefitted significantly from meeting the needs of construction workers. However, the presence of construction workers also has the potential to impact negatively on local family and social networks.

However, based on the findings of the site visit there is not sufficient accommodation in Murraysburg and surrounds to accommodate the ~ 300 workers associated with the construction phase. The issue of accommodation therefore represents a key challenge and will need to addressed in consultation with the BWLM, community representatives and local farmers from Murraysburg should the project proceed.

The implementation of the proposed enhancement measures listed below would also enable the establishment of the proposed WEF to support co-operation between the public and private sectors which would support local economic development in the BWLM.

Potential negative impacts

- Impacts associated with the presence of construction workers on site and in the area;
- Influx of job seekers to the area;
- Increased safety risk to farmers, risk of stock theft and damage to farm infrastructure associated with presence of construction workers on the site;
- Increased risk of veld fires;
- Impact of heavy vehicles, including damage to roads, safety and dust;
- Potential loss of productive farmland associated with construction-related activities.

9.6.1.2 Operational Phase Impacts

- Potential positive impacts
- Creation of employment and business opportunities. The operational phase will also create opportunities for skills development and training;
- Benefits associated with the establishment of a Community Trust;
- The establishment of infrastructure to generate renewable energy.

The total number of permanent employment opportunities associated Phase 1 and 2 of the Umsinde WEF would be ~ 30. Of this total ~ 20 are low skilled workers, 8 semi-skilled and 2 skilled. The annual wage bill for the operational phase will be ~ R 3 million (2015 Rand value). The majority of the beneficiaries are likely to be historically disadvantaged (HD) members of the community. Given the location of the proposed facility the majority of permanent staff is likely to reside in Murraysburg which will benefit the local economy.

The establishment of a Community Trust also creates an opportunity to support local economic development in the area. Community Trusts provide an opportunity to generate a steady revenue stream that is guaranteed for a 20 year period. The revenue from the proposed WEF 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 SMME's.

The long term duration of the revenue stream associated with a WEF linked Community Trust also enables local municipalities and communities to undertake long term planning for the area. Experience has however also shown that Community Trusts can be mismanaged. This issue will need to be addressed in order to maximise the potential benefits associated with the establishment of a Community Trust.

The proposed development also represents an investment in infrastructure for the generation of clean, renewable energy, which, given the challenges created by climate change, represents a positive social benefit for society as a whole.

Potential negative impacts

- The visual impacts and associated impact on sense of place;

- Potential impact on tourism.

Based on the findings of the specialist Visual Impact Assessment (VIA) the significance of the visual impact associated with the WEF with mitigation was rated Moderate Negative. The visual impacts on landscape character associated with large renewable energy facilities, such as WEFs, are highlighted in the research undertaken by Warren and Birnie (2009). In the South African context, the majority of South Africans have a strong connection with and affinity for the large, undisturbed open spaces that are characteristic of the South African landscape. The impact of large, WEFs on the landscape is therefore a key issue in South Africa, specifically given South African's strong attachment to the land and the growing number of renewable energy applications.

The findings of the SIA also indicate that the key affected property in terms of potential visual impacts is Badsfontein Farm owned by Mr Izak van der Merwe (depending on the final turbine layout). In this regard Badsfontein is also impacted by the wind turbines associated with the Ishwati Emoyeni WEF to the north of the farm. If the wind turbines associated with the Umsinde WEF are located in such a way as they are not visible from Badsfontein Farm the significance rating will be Low Negative.

9.6.2 Impact Assessment and Mitigation Measures

9.6.2.1 Construction Phase

Impact assessment of employment and business creation opportunities during the construction phase

Nature: Creation of employment and business opportunities during the construction phase		
	Without Mitigation	With Enhancement
Extent	Local – Regional (2)	Local – Regional (2)
Intensity	Low (1)	High (3)
Duration	Medium Term (2)	Medium Term (2)
Consequence Rating	Low (5)	High (7)
Probability	Probable	Probable
Significance	Medium	HIGH
Status	Positive	Positive
Confidence:	High	High

Enhancement: Essential

- An accredited training and skills development programme aimed at maximising to opportunity for local workers to be employed for the low and semi-skilled positions should be initiated prior to the initiation of the construction phase. The aim of the programme should be to maximise employment opportunities for members of the local community. In this regard the programme should be aimed at community members from Murraysburg, Beaufort West, Graaff-Reinet and Richmond. The programme should be developed in consultation with the Department of Labour and the BWLM. The recommended targets are 50 % and 30 % of low and semi-skilled positions respectively should be taken up by local community members. Due to the low skills levels in the area, the majority of semi-skilled and skilled posts are likely to be filled by people from outside the area;
- The recruitment selection process for the training and skills development programme should seek to promote gender equality and the employment of women wherever possible;
- Before the construction phase commences the proponent should meet with representatives from the BWLM 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 and relevant community representatives 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.

Recommended enhancement measures

The following enhancement measures are also recommended in order to enhance local employment and business opportunities associated with the construction phase:

- Where reasonable and practical the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria;
- The proponent should liaise with the BWLM 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 BWLM, 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.

Note that while preference to local employees and companies is recommended, it is recognised that a competitive tender process may not guarantee the employment of local labour for the construction phase.

Assessment of benefit of technical advice for local farmers and municipalities

Nature: Potential benefit for local farmers and municipalities associated with providing advice on installation of small-scale wind energy technology to supplement their energy needs		
	Without Mitigation	With Enhancement
Extent	Local (1)	Local (1)
Intensity	Low (1)	Medium (1)
Duration	Long Term (3)	Long Term (3)
Consequence	Low (5)	Low (5)
Probability	Probable	Probable
Significance	Low	LOW
Status	Negative	Positive
Confidence:	High	High
Enhancement Measures: The proponent in consultation with the contractor should hold a workshop/s with local farmers and representatives from the BWLM to discuss options for installing small-scale wind energy facilities and the technology and costs involved.		

Assessment of benefit of improving cell phone reception in the area

Nature: Potential benefit for local farmers in terms of improving security on the farms in the area and also enabling local farmers to contact doctors etc. in the event of emergencies.		
	Without Mitigation	With Enhancement
Extent	Local (1)	Local (1)
Intensity	Low (1)	Medium (1)
Duration	Long Term (3)	Long Term (3)
Consequence	Low (5)	Low (5)

Probability	Probable	Probable
Significance	Low	LOW
Status	Negative	Positive
Confidence:	High	High
The proponent in consultation with the contractor should investigate option of establishing a cell phone booster mast on the site.		

Assessment of impact of the presence of construction workers in the area on local communities

Nature: Potential impacts on family structures and social networks associated with the presence of construction workers		
	Without Mitigation	With Mitigation
Extent	Local (1)	Local (1)
Intensity	High (3)	Medium (2)
Duration	Medium Term (2)	Medium Term (2)
Consequence	Medium (6)	Low (5)
Probability	Probable	Probable
Significance	Medium	LOW
Status	Negative	Negative
Confidence:	High	High

Mitigation: Essential

- An accredited training and skills development programme aimed at maximising to opportunity for local workers to be employed for the low and semi-skilled positions should be initiated prior to the initiation of the construction phase. The aim of the programme should be to maximise employment opportunities for members of the local community. In this regard the programme should be aimed at community members from Murraysburg, Beaufort West, Graaff-Reinet and Richmond. The programme should be developed in consultation with the Department of Labour and the BWLM. The recommended targets are 50 % and 30 % of low and semi-skilled positions respectively should be taken up by local community members. Due to the low skills levels in the area, the majority of semi-skilled and skilled posts are likely to be filled by people from outside the area;
- The recruitment selection process for the training and skills development programme should seek to promote gender equality and the employment of women wherever possible;
- The proponent should establish a Monitoring Forum (MF) in order to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should be established before the construction phase commences, and should include key stakeholders, including representatives from the BWLM, farmers and the contractor(s). The MF should also be briefed on the potential risks to the local community and farm workers associated with construction workers;
- The proponent and the contractor(s) should, in consultation with representatives from the MF, develop a code of conduct for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation;
- The proponent and contractor (s) should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase;
- The contractor should provide transport to and from the site on a daily basis for low and semi-skilled construction workers. This will enable the contractor to effectively manage and monitor the movement of construction workers on and off the site;
- The contractors should make the necessary arrangements to transport workers from Beaufort West, Graaff-Reinet and Richmond home over weekends. This will reduce the risk posed to local family structures and social networks in Murraysburg;
- No construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.

Assessment of impact of job seekers on local communities associated with the construction phase

Nature: Potential impacts on family structures, social networks and community services associated with the influx of job seekers		
	Without Mitigation	With Mitigation
Extent	Local (1)	Local (1)
Intensity	Medium (2)	Medium (2)
Duration	Medium Term (2)	Medium Term (2)
Consequence	Low (5)	Low (5)
Probability	Probable	Probable
Significance	Low	LOW
Status	Negative	Negative
Confidence:	Medium	Medium

It is not possible to prevent job seekers from coming to the area in search of a job. However, as indicated above, the potential influx of job seekers to the area as a result of the proposed WEF is likely to be low. In addition:

- 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 and or in Murraysburg (except for local residents).

Assessment of risk to safety, livestock and damage to farm infrastructure

Nature: Potential risk to safety of farmers and farm workers, livestock and damage to farm infrastructure associated with the movement of construction workers on and to the site		
	Without Mitigation	With Mitigation
Extent	Local (1)	Local (1)
Intensity	Medium (2)	Low (1)
Duration	Medium Term (2)	Medium Term (2)
Consequence	Low (5)	Very Low (4)
Probability	Definite	Definite
Significance	Low	VERY LOW
Status	Negative	Negative
Confidence:	High	High

Mitigation: Essential

- The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase proven to be associated with the construction activities for the WEF will be compensated for. The agreement should be signed before the construction phase commences;
- The contractors appointed by the proponent should provide daily transport for low and semi-skilled workers to and from the site. This would reduce the potential risk of trespassing on the remainder of the farm and adjacent properties;
- The proponent should establish a MF (see above) that includes local farmers and develop a Code of Conduct for construction workers. This committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by the proponent and the contractors before the contractors move onto site;
- The proponent should hold contractors liable for compensating farmers in full for any stock losses and/or damage to farm infrastructure that can be linked to construction 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 (EMP) should outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested; • The 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. • The contractors appointed by the proponent must ensure that construction workers who are found guilty of trespassing, 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; • The housing of construction workers on the site should be strictly limited to security personnel.

Assessment of impact of increased risk of grass fires

Nature: Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of grass fires		
	Without Mitigation	With Mitigation
Extent	Local-Regional (2)	Local-Regional (2)
Intensity	Medium (2)	Low (1)
Duration	Medium Term (2)	Medium Term (2)
Consequence	Medium (6)	Low (5)
Probability	Probable	Probable
Significance	Medium	LOW
Status	Negative	Negative
Confidence:	High	High
Mitigation: Essential • The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase proven to be associated with the construction activities for the WEF 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; • The 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; • The contractor should provide adequate firefighting equipment on-site; • The contractor should provide fire-fighting training to selected construction staff; • No construction staff, with the exception of security staff, to be accommodated on site over night; • As per the conditions of the Code of Conduct, in the event of a fire proven to be 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 firefighting costs borne by farmers and local authorities.		

Assessment of the impacts associated with construction vehicles

Nature: Potential dust and safety impacts and damage to road surfaces associated with movement of construction related traffic to and from the site		
	Without Mitigation	With Mitigation
Extent	Local-Regional (2)	Local-Regional (2)

Intensity	Medium (2)	Low (1)
Duration	Medium Term (2)	Medium Term (2)
Consequence	Medium (6)	Low (5)
Probability	Definite	Definite
Significance	Medium	LOW
Status	Negative	Negative
Confidence:	High	High

Mitigation: Essential

- The contractor must ensure that damage caused by construction related traffic to the gravel road between Murraysburg and Richmond, the Swaelkranz Road and the Witteklip Road and local farm roads is repaired on a regular basis throughout the construction phase. The costs associated with the repair must be borne by the contractor. Experience for other renewable energy projects is that the maintenance for roads is the responsibility of the local district roads authority. In many instances the local district roads authority lack the resources to maintain the local road network. In addition, due to legal restrictions, it is not possible for the contractor to repair damage to public roads. This can result in damage to roads not being repaired before the construction phase is completed. This is an issue that should be addressed with the local district roads authority prior to the commencement of the construction phase;
- As far as possible, the transport of components to the site along the N10 should be planned to avoid weekends and holiday periods;
- Sections of the roads that are located adjacent to irrigated lands or farmsteads should be watered regular basis to reduce impact of dust;
- The contractor must ensure that all construction vehicles adhere to speed limits and vehicles used to transport sand and building materials must be fitted with tarpaulins or covers;
- All workers should receive training/ briefing on the reasons for and importance of closing farm gates and driving slowly;
- 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;
- The Contractor should ensure that workers are informed that no waste can be thrown out of the windows while being transported to and from the site. Workers who throw waste out windows should be fined;
- The Contractor should be required to collect waste along the road reserve on a weekly basis;
- Waste generated during the construction phase should be transported to the local landfill site;
- EMP measures (and penalties) should be implemented to ensure farm gates are closed at all times;
- EMP measures (and penalties) should be implemented to ensure speed limits are adhered to at all times.

Assessment of impact on farmland due to construction related activities

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 WEF and power lines will damage farmlands and result in a loss of farmlands for grazing.

	Without Mitigation	With Mitigation
Extent	Local (1)	Local (1)
Intensity	Medium (2)	Low (1)
Duration	Medium Term (2)	Medium Term (2)
Consequence	Low (5)	Very Low (4)
Probability	Definite	Definite
Significance	Low	VERY LOW
Status	Negative	Negative
Confidence:	High	High

Mitigation: Essential • The location of wind turbines, access roads, laydown areas etc. should be informed by the findings of key specialist studies, including the soil and botanical study. In this regard areas of high potential agricultural soils should be avoided; • The location of wind turbines, access roads, laydown areas etc. should be discussed with the locally affected landowners in the finalisation process and inputs provided should be implemented in the layout as best as possible; • The footprint areas for the establishment of individual wind turbines should be clearly demarcated prior to commencement of construction activities. All construction related activities should be confined to the demarcated area and minimised where possible; • An Environmental Control Officer (ECO) should be appointed to monitor the establishment phase of the construction phase; • All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase. The rehabilitation plan should be informed by input from a botanist with experience in arid regions; • 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 drawn up the Environmental Consultants appointed to undertake the EIA; • The implementation of the Rehabilitation Programme should be monitored by the ECO; • All workers should receive training/ briefing on the reasons for and importance of not driving in undesignated areas; • EMP measures (and penalties) should be implemented to strictly limit all vehicle traffic to designated roads and construction areas. Under no circumstances should vehicles be allowed to drive into the veld; • Disturbance footprints should be reduced to the minimum.

9.6.2.2 Operational Phase

Impact assessment of employment and business creation opportunities

Nature: Creation of employment and business opportunities associated with the operational phase		
	Without Mitigation	With Enhancement
Extent	Local (1)	Local (1)
Intensity	Low (1)	Medium (2)
Duration	Long Term (3)	Long Term (3)
Consequence	Low (5)	Medium (5)
Probability	Definite	Definite
Significance	Low	MEDIUM
Status	Positive	Positive
Confidence:	High	High
Enhancement: Essential • The enhancement measures listed in Section 4.4.1, i.e. to enhance local employment and business opportunities during the construction phase, also apply to the operational phase. In addition: • The proponent should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's and locals employed during the operational phase of the project; • The proponent, in consultation with the BWLM, should investigate the options for the establishment of a Community Development Trust (see below).		

Assessment of benefits associated with establishment of community trust

Nature: Establishment of a community trust funded by revenue generated from the sale of energy. The revenue can be used to fund local community development

	Without Mitigation	With Enhancement[20]
Extent	Local-Regional (2)	Local-Regional (2)
Intensity	Low (1)	Medium (2)
Duration	Long Term (3)	Long Term (3)
Consequence	Medium (6)	High (7)
Probability	Definite	Definite
Significance	Medium	HIGH
Status	Positive	Positive
Confidence:	High	High
Enhancement: Essential • The BWLM and members from the local Murraysburg community should be consulted as to the structure and identification of potential trustees to sit on the Trust. The key departments in the BWLM that should be consulted include the Municipal Managers Office, IDP and LED Manager. • 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 funds generated for the Community Trust from the WEF. The proponent is well aware that a large influx of funds into a disadvantaged area presents certain challenges and is committed to managing this process in a responsible and fair manner that benefits the entire community over an extended period of time.		

Implementation of clean, renewable energy infrastructure

Nature: Promotion of clean, renewable energy		
	Without Mitigation[21]	With Mitigation
Extent	Local-Regional (2)	Local-Regional (2)
Intensity	Low (1)	Low (1)
Duration	Long Term (3)	Long Term (3)
Consequence	Medium (6)	Medium (6)
Probability	Definite	Definite
Significance	Medium	MEDIUM
Status	Negative	Positive
Confidence:	High	High
Mitigation: Essential The proponent should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's employed during the operational phase of the project.		

Visual impact and impact on sense of place

Nature: Visual impact associated with the proposed WEF and the potential impact on the areas rural sense of place.		
	Without Mitigation	With Mitigation
Extent	Local-Regional (2)	Local-Regional (2)

[20] Enhancement assumes effective management of the Community Trust
[21] Assumes that the proposed WEF will not be established

Intensity	Medium (2)	Low (1)
Duration	Long Term (3)	Long Term (3)
Consequence	High (7)	Medium (6)
Probability	Definite	Definite
Significance	High	MEDIUM
Status	Negative	Negative
Confidence:	High	High

Mitigation: Essential

- The placement of wind turbines associated with the Umsinde WEF should be done so as to ensure that no wind turbines are visible from Badsfontein Farm, as far as is reasonably possible.;
- The recommendations of the VIA should be implemented.

Potential impact on tourism

Nature: Potential impact of the WEF on local tourism		
	Without Mitigation	With Enhancement / Mitigation
Extent	Local (1)	Local (1)
Intensity	Medium (2)	Low (1)
Duration	Long Term (3)	Long Term (3)
Consequence	Medium (6)	Low (5)
Probability	Definite	Definite
Significance	Medium	LOW
Status	Negative	Negative
Confidence:	High	High

Mitigation: Essential

- The placement of wind turbines associated with the Umsinde WEF should be done so as to ensure that no wind turbines are visible from Badsfontein Farm, as far as is reasonably possible;
- The recommendations of the VIA should be implemented.

9.6.2.3 Decommissioning Phase

Typically, the major social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income. This has implications for the households who are directly affected, the communities within which they live, and the relevant local authorities. However, in the case of the WEFs decommissioning phase is likely to involve the disassembly and replacement of the existing components with more modern technology. This is likely to take place in the 20-25 years post commissioning. The decommissioning phase is therefore likely to create additional, construction type jobs, as opposed to the jobs losses typically associated with decommissioning. Given the relatively small number of people associated with the operational phase of Phase 1 and Phase 2 (~ 30), the potential social impacts linked to the decommissioning of the facility are likely to be limited. The potential negative impacts can also be effectively managed with the implementation of a retrenchment and downscaling programme. With mitigation, the impacts are assessed to be Very Low Negative.

Impacts associated with decommissioning

Nature: social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income

	Without Mitigation	With Mitigation
Extent	Local (1)	Local (1)
Intensity	Low (1)	Low (1)
Duration	Medium Term (2)	Short Term (1)
Consequence	Very Low (5)	Very Low (3)
Probability	Probable	Definite
Significance	Very Low	VERY LOW
Status	Negative	Negative
Confidence:	High	High
Mitigation: Essential • The proponent should ensure that retrenchment packages are provided for all staff retrenched when the WEF is decommissioned; • All structures and infrastructure associated with the proposed facility should be dismantled and transported off-site on decommissioning; • All disturbed areas should be rehabilitated on decommissioning.		

Recommended Additional mitigation measures

The proponent should investigate the option of establishing an Environmental Rehabilitation Trust Fund to cover the costs of decommissioning and rehabilitation of disturbed areas. The Trust Fund should be funded by a percentage of the revenue generated from the sale of energy to the national grid over the 20 year operational life of the facility. The rationale for the establishment of a Rehabilitation Trust Fund is linked to the experiences with the mining sector in South Africa and failure of many mining companies to allocate sufficient funds during the operational phase to cover the costs of rehabilitation and closure. Alternatively, the funds from the sale of the WEF as scrap metal should be allocated to the rehabilitation of the site.

9.6.3 Potential Health Impacts

The potential health impacts typically associated with WEFs include, noise, shadow flicker and electromagnetic radiation. As indicated above, the findings of a literature review undertaken by the Australian Health and Medical Research Council published in July 2010 indicate that there is no evidence of wind farms posing a threat to human health. The research also found that wind energy is associated with fewer health effects than other forms of traditional energy generation, and may therefore in fact result in the minimization of adverse health impacts for the population as a whole (WHO, 2004).

Based on these findings it is assumed that the significance of the potential health risks posed by the proposed WEFs is of low significance. However, the potential for noise impacts generated by the movement of the turbines was raised as concern by Mr Izak van der Merwe of Badsfontein. While adjacent landowners can choose not to look at the wind turbines, they cannot choose not to listen to them.

The noise produced by wind turbines is associated with their internal operation and the movement of the turbine blades through the air. The noise levels are dependent on a number of factors, including, the number of turbines operating, wind speed and direction. Noise levels diminish with distance from the WEF. However, while noise emissions increase with increasing wind speed, this is often, but not always, accompanied by an increase in the background noise environment. The background noise is associated with wind blowing past or through objects, such as trees or buildings. As a result, the background noise near a dwelling may be high enough to 'mask' the sound of the turbines. This may not, however, always be the case.

Concerns have also been raised regarding the potential health impacts associated with low frequency noise (rumbling, thumping) and infrasound (noise below the normal frequency range of human hearing) from wind farms. Research undertaken in Australia indicates that low frequency noise and infrasound levels generated by wind farms are normally at levels that are well below the uppermost levels required to cause any health effects. However, this does not mean that the low, subliminal noise levels that are associated with WEFs do not impact on the psychological well-being of affected parties.

The potential impacts associated with noise can be found in Section 9.9 below.

9.7 Heritage and Palaeontological

9.7.1 Potential Impacts associated with wind energy facilities.

Wind energy facilities are big developments that can produce a wide range of impacts that will affect the heritage qualities of an area. Each turbine site needs road access (9 m wide) that can be negotiated by a heavy lift crane which means that in undulating topography deep cuttings and contoured roads will have to be cut into the landscape to create workable gradients. During the construction phase each of the turbine sites will have to be levelled off to create a solid platform for cranes as well as a lay-down area for materials. This will involve earthmoving and road construction, followed by the bringing in of materials and plant. The actual construction of the turbines will involve excavation into the land surface to a depth of 3 m (or more) and over an area of 400 m^2 for the concrete base. The pre-fabricated steel tower is bolted on to the base and erected in segments. The nacelle containing the generator is finally attached followed by the rotors. The turbines are connected to underground cables to a sub-station (positioned to be determined) where after the generated current will be fed to the national grid via transmission lines. The impacts to palaeontological and archaeological heritage are very similar. Any form of landscape re-modelling has the potential to impact (destroy) any form of material on and close to the surface. The palaeontological specialist study (Volume III) has remarked on the amount of surface exposures of fossils in the study area and gives the area a high significance rating.

9.7.2 Impacts expected during the construction phase of the wind energy facility

During the construction phase the following physical impacts to the landscape and any heritage (including palaeontology) that lies on it can be expected:

- Bulldozing of roads to turbines sites with a possibility of cut and fill operations in places;
- Upgrading of existing farm tracks;
- Creation of working and lay-down areas close to each turbine site;
- Excavation of foundations for each tower;
- Excavation of many kilometres of linear trenches for cables;
- Construction of electrical infra-structure in the form of one or more sub-stations.

In terms of impacts to heritage, palaeontological and archaeological sites which are highly context sensitive are most vulnerable to the alteration of the land surface. The best way to manage impacts to such material is to avoid impacting them. This means micro-adjusting turbine positions where feasible, or routing access roads around sensitive areas. If primary avoidance of the heritage resource is not possible, then some degree of mitigation can be achieved by systematically removing the archaeological material form the landscape. This is generally considered a second best approach as the process that has to be used is exacting and time-consuming, and therefore expensive. Furthermore the NHRA requires that archaeological material is stored indefinitely which has cost implications and places an undue burden on the limited museum storage space available in the provinces.

9.7.3 Impacts expected during operation of the wind energy facility

During the operational life of the wind farm, it is expected that physical impacts to heritage will diminish or cease. Impacts to intangible heritage are expected to occur. Such impacts relate to changes to the feel, atmosphere and identity of a place or landscape. Such changes are evoked by visual intrusion, noise, changes in land use and population density. In the case of this project, impacts to remote and rural landscape and wilderness qualities are possibly of greatest concern. The point at which a wind turbine may be perceived as being "intrusive" from a given visual reference point is a subjective judgment, however it can be anticipated that the presence of such facilities close to (for example) wilderness and heritage areas will destroy many of the intangible and aesthetic qualities for which an area is valued. The fact that turbines are continuously revolving results in a visual impact that can be very disturbing and destructive to the sense of serenity of a place.

- Due to the size of the turbines the visual impacts are largely not easily mitigated (they are easily visible from 10 km) in virtually all landscapes (personal observations), however indications are (PGWC, 2006) that they are perceived to aesthetically/artistically more acceptable in agricultural or manicured landscapes;
- The fact that the turbines are in continuous motion creates a visual impact more severe than that caused by static objects and buildings;
- Shadow flicker – an impact particular to wind turbines, comprises very large moving shadows created by the giant blades when the sun is low on the horizon. Such shadows can extend considerable distances from the turbine. Continuous shadow flicker will have a serious impact on the sense of place of a heritage site;
- Visual impact of road cuttings into the sides of slopes will affect the cultural, natural and wilderness qualities of the area;
- Residual impacts can occur after the cessation of operations. The large concrete turbine bases will remain buried in the ground unless provision has been made to remove them. Bankruptcy or neglect by a wind energy company can result in turbines standing derelict for years creating a long term eyesore.

The remote setting of phases 1 and 2 of the proposed facility will not have a high impact on any commemorated heritage or farm buildings. The closest turbines to structures are roughly 1 km while most are 2-3 km from any historic structures. The setting of many farms on valley floors means that they will be recessed and shielded from direct visual impact in many instances by the topography. However the remote high dolerite scree plateaux's and ridges where the turbines will be situated will lose all sense of wilderness and aesthetic qualities of the landscape will be severely compromised by the new and massive industrial presence.

9.7.4 Impact Assessment and Mitigation Measures

9.7.4.1 Impacts to Palaeontology

Nature of impacts: The main cause of impacts to palaeontological sites is physical disturbance/destruction of fossil material and its context which in the study area, could result in an un-redeemable loss to science and knowledge.

Extent of impacts: It is expected that impacts will be limited (local) There is a chance that the deep excavations for bases could potentially impact buried fossil material, similarly excavation of cable trenches and clearing of access roads could impact material that lies buried in the surface mudstones. Potential impacts caused by power line and proposed access roads are similarly likely to be limited and local. The physical survey of the study area has shown that palaeontological material is common in areas where there is mudstone geology, and often visible on the surface.

Significance of impacts: In terms of the information that has been collected, indications are that impacts to palaeontology may occur in mudstone areas. Impacts are not expected in the high dolerite areas where many of the turbines are to be situated. The impacts have the potential to be of high to medium negative significance, however proper mitigation may result in a positive impact which will derive knowledge.

Status of impacts: The destruction of palaeontological material is usually considered to be negative; however opportunities for the advancement of science and knowledge can result provided that professional assessments and mitigation is carried out. Without mitigation the impact will be medium negative, but potentially positive with successful mitigation.

Impacts to Palaeontology

Impact	Consequence	Probability	Significance	Status	Confidence
Impact 1: Disturbance, damage or destruction of well-preserved fossils at or beneath the ground surface during the construction phase (especially due to bedrock excavations, ground clearance).	High	Possible	MEDIUM	–ve	Medium
Essential Mitigation measures: Conduct a pre-disturbance inspection of any infrastructure that is to be positioned on sensitive geology. Sensitive specimens will need to be recorded and removed. Best Practice mitigation: The employment of a palaeontologist during the construction phase, establishment of on-site curation facilities and identification of a repository for specimens.					
With Mitigation	Medium	Possible	LOW	-ve & +ve	Medium

Palaeontological mitigation

- Once the final layout of the WEF and associated transmission line is determined, a pre-construction palaeontological study be undertaken of those limited sectors of the footprint that overlie potentially-fossiliferous sediments (*i.e.* Lower Beaufort Group bedrocks, older consolidated alluvium). The study should be carried out by a suitably qualified palaeontologist and would involve (a) recording of near-surface fossil material, including relevant geological data (*e.g.* stratigraphy, sedimentology, taphonomy), (b) judicious sampling of scientifically-valuable fossils as well as (c) making recommendations regarding further mitigation or conservation of specific fossil sites for the construction phase of the WEF and transmission line.
- During the construction phase a chance-finds procedure should be applied should substantial fossil remains such as vertebrate bones, teeth or trackways, plant-rich fossil lenses or dense fossil burrow assemblages be exposed by excavation or discovered within the development footprint. The responsible Environmental Control Officer should safeguard the fossils, preferably *in situ*, and alert the responsible heritage management authority (Heritage Western Cape for the Western Cape, SAHRA for the Northern Cape) so that appropriate action can be taken by a professional palaeontologist, at the developer’s expense. Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (*e.g.* stratigraphy, sedimentology, taphonomy) by a professional palaeontologist.

- Palaeontological mitigation recommendations should be incorporated into the Construction Environmental Management Plan (EMP) for the Umsinde Emoyeni Wind Energy Facility and associated transmission line. Provided that the recommended mitigation measures are carried through, it is likely that any potentially negative impacts of the proposed developments on local fossil resources will be substantially reduced. Furthermore, they will be partially offset by the *positive* impact represented by our increased understanding of the palaeontological heritage of the Great Karoo region.

9.7.4.2 Impacts to archaeological material and rock engravings

Nature of impacts: The main cause of impacts to archaeological sites is physical disturbance of the material itself and its context. The heritage and scientific potential of an archaeological site is highly dependent on its geological and spatial context. This means that even though, for example a deep excavation may expose archaeological artefacts, the artefacts are relatively meaningless once removed from the area in which they were found. In the case of the proposed activity the main source of impact is likely to be the construction of access roads, lay-down areas and excavation of the footings the turbines.

Extent of impacts: It is expected that impacts will be limited (local) There is a chance that the deep excavations for bases could potentially impact buried archaeological material, similarly excavation of cable trenches and clearing of access roads could impact material that lies buried in the surface sand. Potential impacts caused by power line and proposed access roads are similarly likely to be limited and local. The physical survey of the study area has shown that archaeological material is insignificant and dispersed, which means that the extent of impacts is likely to be highly localised (if at all), with no regional implications for heritage of this kind.

Significance of impacts: In terms of the information that has been collected, indications are that impacts to pre-colonial archaeological material will be limited. In terms of buried archaeological material, one can never be sure of what lies below the ground surface, however indications are that this is extremely sparse and that impacts caused by the construction of footings and other ground disturbance is likely to be negligible.

Status of impacts: The destruction of archaeological material is usually considered to be negative; however opportunities for the advancement of science and knowledge about a place can result provided that professional assessments and mitigation is carried out in the event of an unexpected find. In this case there is so little material on site that there will be no opportunity to benefit therefore the impact will be neutral.

Impacts to archaeology

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Local 1	Medium 2	Long-term 3	Medium 6	Probable	Medium	– ve	High
Essential mitigation measures: Conduct a final walk down of roads and check turbines positions for archaeological material. In the improbable event of archaeological material being found, this will need to be subject to sampling and removal from site under a work plan (Heritage Western Cape) or a permit (Eastern Cape Heritage Authority) Check dolerite clusters and flat dolerite rafts for rock engravings. Rock engravings must be assigned co-ordinates, photographed (so as to record detail) and moved out of harm's way, or the road adjusted to avoid them.								
With mitigation	Local 1	Low 1	Long-term 3	Low 5	Improbable	VERY LOW	Neut	High

9.7.4.3 Colonial period heritage

Colonial period heritage – that is buildings and historical sites of significance have been identified within the boundaries of the study area.

Nature of impacts: Historic structures are sensitive to physical damage such as demolition as well as neglect. They are also context sensitive in that changes to the surrounding landscape will affect their significance.

Extent of Impacts: Direct impacts are not expected. Some visual impacts in terms of Karoo context are expected.

Significance of impacts: Given that there are no structures or historical sites that will be affected by Phase 2 of Umsinde Emoyeni physical impacts will be low, but impacts to context at some sites will be medium significance.

Status of impacts: Within the boundaries of the proposed wind energy facility, impacts are considered to be low negative.

Impacts to colonial period heritage

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Local 1	Medium 2	Long-term 3	Medium 6	Probable	Medium	– ve	High
Essential mitigation measures: No essential mitigation measures are suggested. Best practice mitigation measures Re-use and sensitive repair of abandoned farm houses would make a positive contribution to heritage conservation. Refurbishment should be done under the advice of a heritage architect/consultant.								
With mitigation	Local 1	Low 2	Long-term 3	Low 5	Probable	MEDIUM	+ve	High

9.7.4.4 Cultural landscape and setting

Nature of impacts: Cultural landscapes are highly sensitive to accumulative impacts and large scale development activities that change the character and public memory of a place.

In terms of the National Heritage Resources Act, a cultural landscape may also include a natural landscape of high rarity value, aesthetic and scientific significance. The construction of a large facility can result in profound changes to the overall sense of place of a locality, if not a region. The remoteness of areas selected for especially phase 1 of UmSinde Emoyeni has mitigated somewhat this impact.

Extent of impacts: Wind Turbines are without doubt conspicuous structures which will affect the atmosphere of the "place". While this impact may be considered local in terms of physical extent, there may be wider implications in terms of the change in "identity" of the area and the accumulative effect this could have on future tourism potential. The impact of the proposed activity will be local but with a likely contribution to accumulative impacts.

Significance of impacts: The impact of the proposed activity is medium.

Status of impacts: The status of the impact is negative.

Impacts to cultural landscape and setting

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Local 1	Medium 2	Long-term 3	Medium 6	Likely	Medium	– ve	High
Essential mitigation measures: Mitigation not possible								
With mitigation	Local 1	Low 2	Long-term 3	Medium 6	Likely	MEDIUM	-ve	High

9.8 Visual

9.8.1 Impact Identification

During the construction phase there is the potential for intrusion caused by heavy construction vehicles and cranes, stockpiling of materials, construction camps and excavations, including dust and noise. The receptors will be residents, visitors and road users in proximity to the overall project.

The proposed industrial infrastructure (powerlines, access roads and substation) have the potential for visual intrusion on the Karoo's rural 'sense of place'.

Potential visual impacts have been identified in the table below, and assessed in the sections that follow.

Table 10 Potential Visual Impacts

Source	Pathway	Receptor
The large number and scale of proposed wind turbines (up to 98 turbines in each of the 2 phases) reaching up to 140 m in height.	The potential visual intrusion of the wind turbines on the skyline and on scenic resources, such as the characteristic dolerite koppies and ridges. Potential visual disturbance caused by the flicker-effect.	Residents of Murraysburg and outlying farms, game farms and guest farms, commuters on the R63 and district gravel roads, and visitors and tourists to the area.

The potential flicker effect of the rotors in the early morning and evening. The potential effect of red navigation lights at night on certain wind turbines. The potential effect of noise from the wind turbines.	Potential visual intrusion of the red lights on the Karoo night sky. Potential disturbance to the valued quiet of the Karoo.	
The proposed related infra-structure, such as powerlines, access roads, substation and O&M buildings.	Potential visual intrusion of the industrial infrastructure on the Karoo's rural 'sense of place'.	As above, both within the viewsheds, as well as in the general area.
The potential effect of activities during the construction phase of the proposed WEF project.	Potential intrusion caused by heavy construction vehicles and cranes, stockpiling of materials, construction camps and excava-tions, including dust and noise.	Residents, visitors and road users in proximity to the overall project area.

9.8.2 Visual Assessment Methodology

The visual assessment is based on a number of quantitative and qualitative criteria to determine potential visual impacts, as well as their relative significance. The criteria are listed below:

Visual Exposure

Visual exposure is determined by the viewshed, being the geographic area within which the project would be visible (Figure 9.1). The boundary of the viewshed tends to follow ridgelines and high points in the landscape. Some areas within the viewshed fall within a view shadow, and would therefore not be affected by the proposed development. The viewsheds indicate potentially less visual exposure to the east because of a line of ridges.

Visual Sensitivity

Visual sensitivity is determined by topographic features, steep slopes, rivers, scenic routes, cultural landscapes, and tourist facilities such as guest farms.

Landscape Integrity

Visual quality is enhanced by the scenic or rural quality and intactness of the landscape, as well as lack of other visual intrusions. The Karoo landscape of the study area is at present generally intact with few visual intrusions. The proposed WEF therefore has potential significance in terms of altering the rural landscape.

Cultural Landscape

Besides natural attributes, landscapes have a cultural value, enhanced by the presence of palaeontological and archaeological sites, historical settlements, farmsteads and cultivated lands.

Visual Absorption Capacity

This is the potential of the landscape to screen the project. The study area has a few ridges and koppies, which will tend to have a screening effect at the broader scale, but is otherwise relatively open and visually exposed in terms of the more immediate surroundings, and therefore locally has a relatively low visual absorption capacity.

9.8.3 Visual Impact Assessment Criteria

The extent of the area over which the visual impact will be experienced will be confined to the study area with an approximate radius of 30 km, and is therefore considered local.

The criteria were considered in combination to determine the potential visual impact 'intensity' as indicated in Table 11. This resulted in a high intensity value with the scenic or visual characteristics of the area becoming severely altered.

Table 11: Intensity of Potential Visual Impacts

Criteria	Comments	Phase 2 wind turbines	Phase 2 infrastructure / powerlines	Phase 2 construction activities
Visibility of facilities Distance from selected viewpoints (Table 3)	Large number of turbines. Viewing distance is a mitigating factor in some cases, but nearer to sensitive receptors. Powerline for Phase 2 only a short length. Construction activities are an aggravating factor.	Very high (5)	Medium (3)	Very high (5)
Visual exposure Zone of visual influence or view catchment	Most visual exposure is to the south and west, but less to the north and east because of surrounding ridges. Sensitive receptors within powerline viewshed.	High (4)	Medium (3)	High (4)
Visual sensitivity Effect on landscape features, scenic resources	Includes topographic features, skyline ridges, steep slopes, road corridors and farmsteads. General remoteness is a mitigating factor.	High (4)	Medium (3)	High (4)
Landscape integrity Effect on rural/ natural character of the area	Largely intact natural / rural landscape would be affected by industrial type development.	Very high (5)	Medium (3)	Very high (5)
Visual absorption capacity (VAC)	Surrounding ridges provide some visual enclosure / absorption, but vegetation is low / sparse.	Medium (3)	Medium (3)	Medium (3)
Overall visual impact intensity	Combination of the characteristics above.	Very high (21)	Medium (15)	Very high (21)

Rating values: Very low (1), Low (2), Medium (3), High (4), and Very high (5).
Overall values: Very low (1-5), Low (6-10), Medium (11-15), High (15-20), Very high (21+)

9.8.4 Impact Assessment

Visual Impact of Wind Turbines with Mitigation

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Local 1	Very High 3	Long-term 3	High 7	Definite	High	– ve	High
Essential mitigation measures: Visually sensitive peaks, major ridgelines and scarp edges, including 500 m buffers, to be avoided, because of silhouette effect on the skyline over large distances. Peaks marked in yellow on Figure 9.2 are important topographic features to be avoided in particular. Slopes steeper than 1:5 gradient to be avoided. Cultural landscapes or valuable cultivated land, particularly along alluvial river terraces to be avoided. Stream features, including 250 m buffers, to be avoided. Buffers around settlements, farmsteads and roads, as indicated to be observed.								
With mitigation	Local 1	Medium 2	Long-term 3	Medium 6	Probable	MEDIUM	– ve	Medium

Construction Phase Visual Impacts with Mitigations

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigation	Local 1	Very High 3	Short-term 1	Low 5	Probable	Low	– ve	Medium
Essential mitigation measures: Access and haul roads to use existing farm tracks as far as possible. Construction camp, stockpiles and lay-down area to be located out of sight of district roads, possibly in the vicinity of the proposed substation and O&M buildings. Disturbed areas rather than pristine or intact land to preferably be used for the construction camp. Construction camp and laydown areas to be limited in area to only that which is essential. Measures to control wastes and litter to be included in the contract specification documents. Provision to be made for rehabilitation/ re-vegetation of areas damaged by construction activities.								
With mitigation	Local 1	High 3	Short-term 1	Low 5	Probable	LOW	– ve	Medium

9.9 Noise

9.9.1 Potential Noise Sources – Construction Phase

9.9.1.1 Construction Equipment

The equipment likely to be required to complete the above tasks will typically include:

excavator/graders, bulldozer(s), dump trucks(s), vibratory roller, bucket loader, rock breaker(s), drill rig, flatbed truck(s), pile drivers, TLB, concrete truck(s), crane(s), fork lift(s) and various 4WD and service vehicles.

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. Potential maximum noise levels generated by various construction equipment as well as the potential extent of these sounds are presented in Volume III – Specialist Study Reports – Noise Impact Assessment Report.

Average or equivalent sound levels are another factor that impacts on the ambient sound levels and is the constant sound level that the receptor can experience. Typical sound power levels associated with various activities that may be found at a construction site is presented in Volume III – Specialist Study Reports – Noise Impact Assessment Report.

9.9.1.2 Traffic

A significant source of noise during the construction phase is additional traffic to and from the site, as well as traffic on the site. This will include trucks transporting equipment, aggregate and cement as well as various components used to develop the wind turbine.

Construction traffic is expected to be generated throughout the entire construction period, however, the volume and type of traffic generated will be dependent upon the construction activities being conducted, which will vary during the construction period. Noise levels due to additional traffic will be estimated using the methods stipulated in SANS 10210:2004 (Calculating and predicting road traffic noise).

9.9.1.3 Blasting

Blasting may be required as part of the civil works to clear obstacles or to prepare foundations. However, blasting will not be considered during the EIA phase for the following reasons:

- Blasting is highly regulated, and control of blasting to protect human health, equipment and infrastructure will ensure that any blasts will use the minimum explosives and will occur in a controlled manner. The breaking of obstacles with explosives is also a specialized field and when correct techniques are used, causes significantly less noise than using a hydraulic rock-breaker.
- People are generally more concerned about ground vibration and air blast levels that might cause building damage than the impact of the noise from the blast. However, these are normally associated with close proximity mining/quarrying.
- Blasts are an infrequent occurrence, with a loud but a relative instantaneous character. Potentially affected parties generally receive sufficient notice (siren) and the knowledge that the duration of the siren noise as well as the blast will be over relative fast results in a higher acceptance of the noise. Note that with the selection of explosives and blasting methods, noise levels from blasting is relatively easy to control.

9.9.2 Potential Noise Sources Operational Phase: Wind Turbine Noise

Wind turbines do generate sound in both the inaudible and audible frequency range. However, the manner how this sound is perceived by people would range between people, communities as well as the surrounding environmental conditions in which they live. There are some studies[22] that shows correlations between noise annoyance and a dislike to the facility, with other studies showing a link between wind turbines and increased annoyance

[22] Gibbons, 2014; Crichton, 2014; Atkinson-Palmbo, 2014; Chapman, 2013; Pedersen, 2003.

levels[23]. Annoyance levels can be further subdivided into people that are annoyed by increased noise levels to the point where people report having to leave their houses to get relieve from the noise.

How widespread annoyance and health issues are yet to be defined, as there has not been an industry wide scientific study covering noise from wind turbines. Values of 5 – 15 % appear to be the most cited, although it depends on the source. When questioned (during a presentation to the Lee County Zoning Board of Appeals) Phillips (2011) told the board

"*that there have not been solid studies of that, but that his best guess, based on what research has been done, is about 5 % of those within a mile or so, with some reports of health effects out to two miles*"[24].

A search on the internet identifies groups that scour the internet for studies, reports and articles about wind energy; some focusing on the positive stories yet others gathering everything mentioned about the negatives, unfortunately also reporting all the negatives as fact without considering all the data. There are numerous wind farms where there has been no noise complaints (a UK study suggest that about 20 % of wind farms generated noise complaints, Cummings, 2011), yet there has been no study assessing the differences between these wind farms.

Cummings (2012) also reports that:

"*it's notable that in ranching country, where most residents are leaseholders and many live within a quarter to half mile of turbines, health and annoyance complaints are close to non-existent; some have suggested that this is evidence of an antidote to wind turbine syndrome: earning some money from the turbines. More to the point, though, the equanimity with which turbine sound is accommodated in ranching communities again suggests that those who see turbines as a welcome addition to their community are far less likely to be annoyed, and thus to trigger indirect stress-related effects. Equally important to consider, ranchers who work around heavy equipment on a daily basis are also likely to be less noise sensitive than average, whereas people who live in the country for peace and quiet and solitude are likely more noise-sensitive than average. And, there are some indications that in flat ranching country, turbine noise levels may be steadier, less prone to atmospheric conditions that make turbines unpredictably louder or more intrusive. When considering the dozens of wind farms in the Midwest and west where noise complaints are minimal or non-existent, it remains true that the vast majority of U.S. wind turbines are built either far from homes or in areas where there is widespread tolerance for the noise they add to the local soundscape.*"

However, on the other hand, there are reports of significant annoyance (that can lead to increased stress levels that can result in other health problems or increase existing problems) from individuals and communities, frequently from people that value the rural quiet and sense of place.

Therefore, when assessing the potential noise impacts one have to considering:

- the complex characteristic of noise from wind turbines (numerous factors that are not yet fully understood);
- the numerous reports about noise impacts;
- the rural character and existing sense of place;
- the recommendations from recognised acousticians.

The assessment methodology does consider these factors as discussed in the following section.

[23] Thorne, 2010; *Ambrose, 2011; Pierpont, 2009; Nissenbaum, 2012; Knopper, 2011; Kroesen, 2011; Philips, 2011; Shepherd, 2011a; Shepherd, 2011b; Pedersen, 2011; Wang, 2011; Cooper, 2012; McMurtry, 2011; Havas, 2011; Jeffery, 2013*
[24] Cummings, 2012

9.9.3 Noise Impacts on Animals

A great deal of research was conducted in the 1960's and 1970's on the effects of aircraft noise on animals. While aircraft noise have a specific characteristic that might not be comparable with industrial noise, the findings should be relevant to most noise sources.

Overall, the research suggests that species differ in their response to:

- Various types of noise;
- Durations of noise; and
- Sources of noise.

A general animal behavioural reaction to aircraft noise is the startle response. However, the strength and length of the startle response appears to be dependent on:

- which species is exposed;
- whether there is one animal or a group; and
- whether there have been some previous exposures.

Unfortunately, there are numerous other factors in the environment of animals 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.

From these and other studies the following can be concluded:

- Animals respond to impulsive (sudden) noises (higher than 90 dBA) by running away. If the noises continue, animals would try to relocate.
- Animals of most species exhibit adaptation with noise, including aircraft noise and sonic booms.
- More sensitive species would relocate to a more quiet area, especially species that depend on hearing to hunt or evade prey, or species that makes use of sound/hearing to locate a suitable mate.
- Noises associated with helicopters, motor- and quad bikes significantly impact on animals.

9.9.3.1 Wildlife

Studies showed 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.

9.9.4 Why noise concerns communities[25]

Noise can be defined as "unwanted sound", and an audible acoustic energy that adversely affects the physiological and/or psychological well-being of people, or which disturbs or impairs the convenience or peace of any person. One can generalise by saying that sound becomes unwanted when it:

- Hinders speech communication;
- Impedes the thinking process;
- Interferes with concentration;
- Obstructs activities (work, leisure and sleeping); and
- Presents a health risk due to hearing damage.

[25] World Health Organization, 1999; Noise quest, 2010; Journal of Acoustical Society of America, 2009

However, it is important to remember that whether a given sound is "noise" depends on the listener or hearer. The driver playing loud rock music on their car radio hears only music, but the person in the traffic behind them hears nothing but noise.

Response to noise is unfortunately not an empirical absolute, as it is seen as a multi-faceted psychological concept, including behavioural and evaluative aspects. For instance, in some cases, annoyance is seen as an outcome of disturbances, in other cases it is seen as an indication of the degree of helplessness with respect to the noise source.

Noise does not need to be loud to be considered "disturbing". One can refer to a dripping tap in the quiet of the night, or the irritating "thump-thump" of the music from a neighbouring house at night when one would like to sleep.

Severity of the annoyance depends on factors such as:

- Background sound levels, and the background sound levels the receptor is used to;
- The manner in which the receptor can control the noise (helplessness);
- The time, unpredictability, frequency distribution, duration, and intensity of the noise;
- The physiological state of the receptor; and
- The attitude of the receptor about the emitter (noise source).

9.9.5 Construction Phase Noise Impacts

This section investigates the conceptual construction activities. Construction activities are highly dependent on the final operational layout. Two layouts were modelled against sensitive receptors, it can be seen from these layouts that a number of different activities might take place close to potentially sensitive receptors, each with a specific potential impact.

9.9.5.1 Description of Construction Activities Modelled

The following construction activities could take place simultaneously and were considered:

- General work at a temporary workshop area. This would be activities such as equipment maintenance, off-loading and material handling. All vehicles will travel to this site where most equipment and material will be off-loaded (general noise, crane). Material, such as aggregate and building sand, will be taken directly to the construction area (foundation establishment). It was assumed that activities will be taking place for 16 hours during the 16 hour daytime period.
- Surface preparation prior to civil work. This could be the removal of topsoil and levelling with compaction, or the preparation of an access road (bulldozer/grader). Activities will be taking place for 8 hours during the 16 hour daytime period.
- Preparation of foundation area (sub-surface removal until secure base is reached – excavator, compaction, and general noise). Activities will be taking place for 10 hours during the 16 hour daytime period.
- Pouring and compaction of foundation concrete (general noise, electric generator/compressor, concrete vibration, mobile concrete plant, TLB). As foundations must be poured in one go, the activity is projected to take place over the full 16 hour day time period.
- Erecting of the wind turbine generator (general noise, electric generator/compressor and a crane). Activities will be taking place for 16 hours during the 16 hour daytime period.
- Traffic on the site (trucks transporting material, aggregate/concrete, work crews) moving from the workshop/store area to the various activity sites. All vehicles to travel at less than 60 km/h, with a maximum of five (5) trucks and vehicles per hour to be modelled travelling to the areas where work is taking place (red line).

There will be a number of smaller equipment, but the addition of the general noise source (at each point) covers most of these noise sources. It is assumed that all equipment would be operating under full load (generate the most noise) at a number of locations and that atmospheric conditions would be ideal for sound propagation. This is likely the worst case scenario that can occur during the construction of the facility.

As it is unknown where the different activities may take place it was selected to model the impact of the noisiest activity (laying of foundation totalling 113.6 dBA cumulative noise impact – various equipment operating simultaneously) at all locations (over the full daytime period of 16 hours) where wind turbines may be erected for both layouts, calculating how this may impact on potential noise-sensitive developments (see Plate 13). Noise created due to linear activities (roads) were also evaluated and plotted against distance as illustrated in Plate 14[26].

Even though construction activities are projected to take place only during day time, it might be required at times that construction activities take place during the night (particularly for a large project). Construction activities that may occur during night time:

- Concrete pouring: Large portions of concrete do require pouring and vibrating to be completed once started, and work is sometimes required until the early hours of the morning to ensure a well-established concrete foundation. However the work force working at night for this work will be considerably smaller than during the day.
- Working late due to time constraints: Weather plays an important role in time management in construction. A spell of bad weather can cause a construction project to fall behind its completion date. Therefore, it is hard to judge beforehand if a construction team would be required to work late at night.

9.9.6 Construction Phase Impact Assessment and Mitigation Measures

Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Local 1 Daytime construction activities will generate noises but it will mainly be limited to the project site and directly adjacent properties.	Low 1 NSDs may experience increased noise levels, and these receptors may detect in increase in ambient sound levels. These increases in levels will be very low.	Long 3 Noises will continue for the constructi on and operation al phase.	Low 5	Improbable The projected noise levels during construction will be similar to the expected ambient sound levels. The probability of an impact is considered unlikely.	VERY LOW	Negative	High
Mitigation:	*Mitigation is not required*						

[26] Sound level at a receiver set at a certain distance from a road – 10 trucks per hour gravel and tar roads

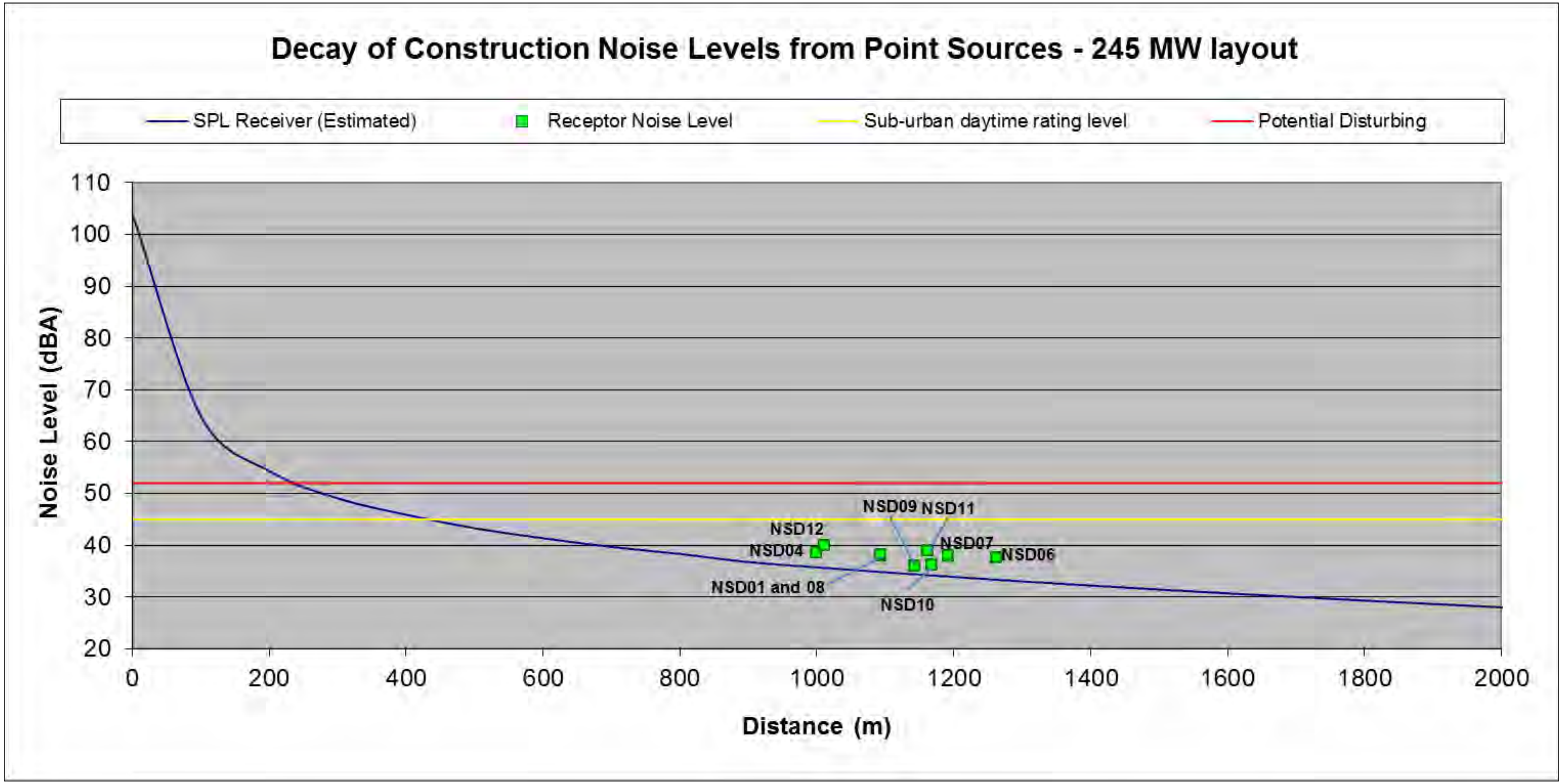


Plate 13 Projected conceptual construction noise levels – Decay of noise from construction activities

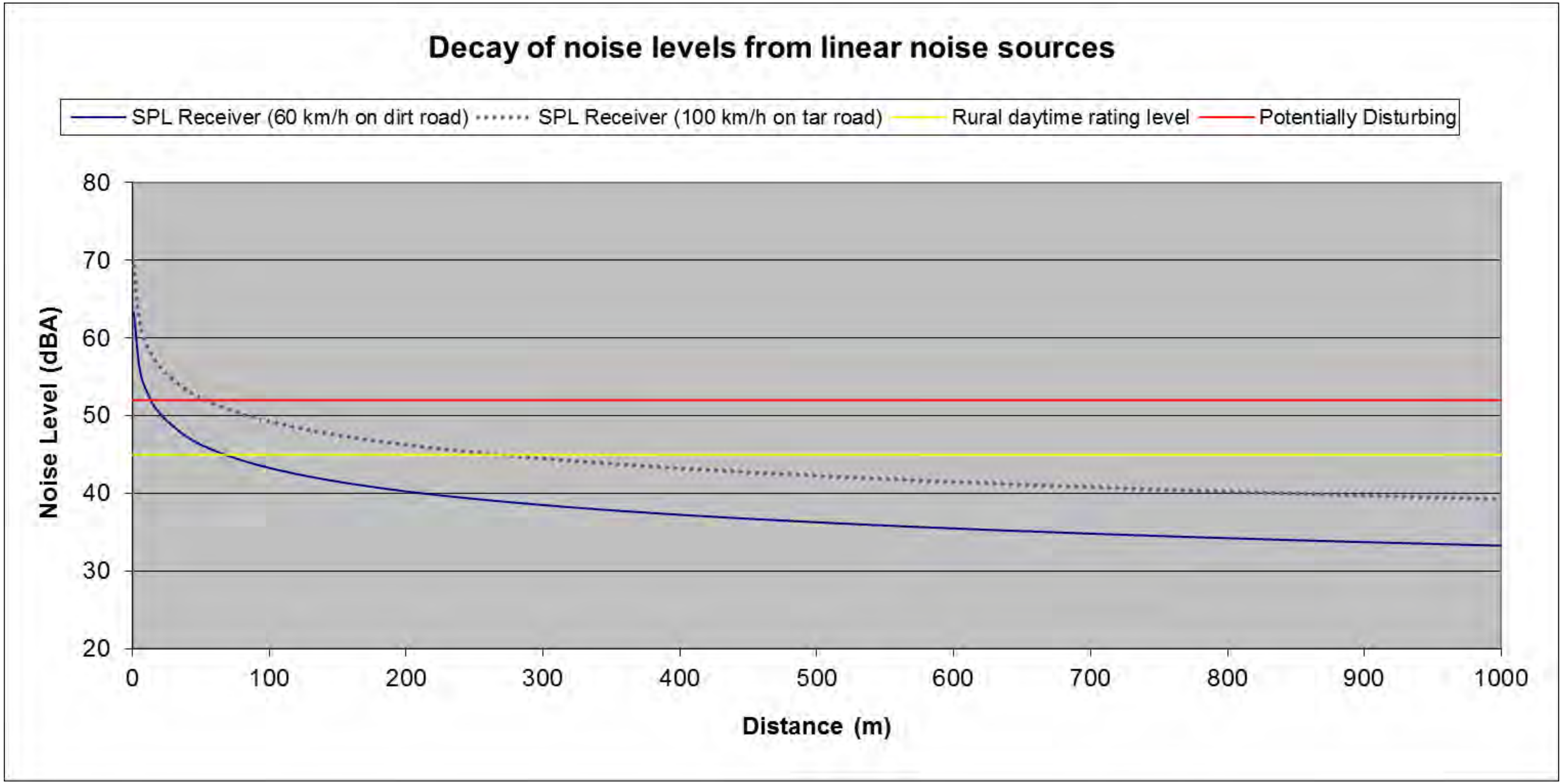


Plate 14 Projected conceptual construction noise levels – Decay over distance from linear activities

9.9.7 *Operational Phase Noise Impacts*

Typical day time activities would include:

- The operation of the various Wind Turbines, and
- Maintenance activities (relatively insignificant noise source).

The daytime period however, was not considered for the EIA because noise generated during the day by the WEF is generally masked by other noises from a variety of sources surrounding potentially noise-sensitive developments. However, times when a quiet environment is desired (at night for sleeping, weekends etc.) ambient sound levels are more critical. The time period investigated therefore would be a quieter period, normally associated with the 22:00 – 06:00 timeslot. Maintenance activities would therefore not be considered, concentrating on the ambient sound levels created due to the operation of the various Wind Turbine Generators (WTGs) at night.

The noise assessment report makes use of the sound power emission levels for a Vestas V117 3.3 MW wind turbine. The calculated octave sound power levels of this noise source as used for modelling are presented in Table 16. The maximum sound power emission levels were used for all calculations.

Table 12: Octave Sound Power Emission Levels used for modelling: Vestas V117 3.3 MW

Wind Turbine: Vestas V117 3.3 MW at 116.5 m HH										
Source Reference: DMS no.: 0038-6455-V00, 2013-06-07										
Z-Weighted Octave Sound Power Levels (dB)										
Frequency	16.0	31.0	63.0	125.0	250.0	500.0	1000.0	2000.0	4000.0	Total (dBA)
3.0	104.6	103.2	108.1	103.1	97.5	91.8	88.6	83.7	80.4	95.2
4.0	110.9	107.9	108.6	104.6	100.4	95.9	92.3	87.2	83.2	98.4
5.0	116.0	111.3	109.7	107.3	103.9	100.3	96.5	91.6	86.8	102.3
6.0	119.8	114.1	111.6	110.0	106.3	103.4	99.8	95.4	90.2	105.4
7.0	121.7	116.1	113.2	111.2	106.8	104.1	101.3	97.7	92.1	106.6
8.0	123.3	118.6	115.2	111.4	106.3	103.7	101.9	99.1	93.5	107.0
9.0	125.2	121.3	116.8	110.9	105.4	102.8	102.0	99.8	94.4	107.0
10.0	128.6	123.6	116.8	110.2	105.2	102.9	101.9	100.0	94.7	107.0

9.9.8 *Review of layout of the 245MW Wind Energy Facility*

Please note that the project cannot be greater than 140 MW as that is the maximum name plate capacity that the REIPPPP allows. The figure here of 245 MW is therefore a theoretical maximum and is based on 98 turbines at 2.5 MW per machine (the worst case-scenario layout).

Table 13 defines the noise rating levels at the closest potential noise-sensitive receptors.

Table 13: Noise rating levels at closest potential noise-sensitive receptors, 245 MW Layout (maximum sound power emission levels)

NSD	Phase 2 (dBA)
1	36.1
2	25.4
3	0

4	0
5	9.1
6	37.4
7	36
8	36.3
9	33.4
10	34.1
11	36.9
12	39.6
13	26.9

9.9.9 Operational Phase Noise Impact Assessment

The impact assessment for the various operational activities will increase the ambient noise levels in the area. The noise impact is assessed and summarized in Table 14. Only the night-time scenario was assessed as this is the most critical time period when a quiet environment is desired.

Night-time operational activities will generate noises that are highly unlikely to change ambient sound levels further than 1,000 m from the wind turbines. Therefore the extent of this impact is local.

As with the construction phase, operational activities will result in a slight impact on the ambient sound levels. Noise rating levels is exceeded at NSD04. The noise magnitude is generally low (less than 3 dBA). Noises will continue for the operational phase, estimated 20 – 25 years, therefore the duration is long-term. Ambient sound levels typically range between 30 – 40 dBA at low winds, which increased as the wind speeds increased. Based on measurements collected in similar areas, including at existing operational wind turbines, it is unlikely that there will be a noise impact at locations further than 1,000 m from the turbines. The probability of an impact is considered unlikely but to allow for all uncertainties, this is raised to possible.

Table 14: Impact Assessment: Operational Activities – 245 MW layout

Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Local 1	Low 1	Long 3	Low 5	Possible	VERY LOW	(-) ve	High
Mitigation	Mitigation is not required						

9.10 Site Sensitivity and Buffers

The ecological sensitivity map for the affected parts of the site is illustrated below in Figure 9.4. 5 turbines are located within dolerite outcrops and an additional 20 on steep slopes and 5 within areas classified as High sensitivity as they are within washes. The turbines within the washes should be moved out of these areas as the washes are sensitive areas vulnerable to disturbance. Similarly, the number of turbines within the dolerite outcrops should be reduced as much as possible. In terms of Phase 2, 5 turbines are located within the dolerite outcrops and an additional 20 on steep slopes and 5 within areas classified as High sensitivity as they are within washes. The turbines within the washes should be moved out of these areas as the washes are sensitive areas vulnerable to disturbance. Similarly, the number of turbines within the dolerite outcrops should be reduced as much as possible.

Phase 2 is considered to have a greater impact than Phase 1 because it is more dispersed and would generate an impact across a greater area and there are also more turbines within sensitive habitats. Under the assessed layout, most turbines are less than 500m apart, meaning that any point within the turbine field is likely to be less than 250m from a wind turbine. Noise levels generated by turbines are relatively high within the context of a natural environment with little other background noise pollution and many species may find the wind farm environment unfavourable as a result. Therefore, for many fauna, the footprint of the development should not be considered equivalent to the extent of transformation, but rather to the full occupied extent of the wind farm which is as much as $100km^2$ for Phase 2. Such potential habitat loss and disruption of landscape connectivity is considered one of the major impacts of the development.

Presently there are no prescribed aquatic buffers other than those proposed in this portion of the Western Cape, thus the, recommendations by Desmet and Berliner (2007) will be applied as these are becoming more widely accepted. These are shown below, to make the engineers and contractors aware of these buffers during the planning phase, i.e. construction, associated batch plants, stockpiles, lay down areas and construction camps should avoid these buffer areas i.e. 32 m for this development.

Table 15 Recommended buffers for rivers, with those applicable to the project highlighted in blue

River criterion used	Buffer width (m)	Rationale
Mountain streams and upper foothills of all 1:500 000 rivers, i.e. rivers mapped at this scale by DWS	50	These longitudinal zones generally have more confined riparian zones than lower foothills and lowland rivers and are generally less threatened by agricultural practices.
Lower foothills and lowland rivers of all 1:500 000 rivers i.e. rivers mapped at this scale by DWS	100	These longitudinal zones generally have less confined riparian zones than mountain streams and upper foothills and are generally more threatened by development practices.
All remaining 1:50 000 scale streams, i.e. all systems that appear on the topo-cadastral maps	32	Generally smaller upland streams corresponding to mountain streams and upper foothills, smaller than those designated in the 1:500 000 rivers layer. They are assigned the riparian buffer required under South African legislation.

An Avifaunal Sensitivity Map was created (Figures 9.5) using flight line data of priority species recorded during the 12 month pre-construction bird monitoring at the WEF site.

Observed flight sensitivity was determined by creating a Grid Cell Sensitivity Score (GCSS), falling within either a Low, Medium or High classification for a 200 m x 200 m grid covering the WEF site. The GCSS was derived by analysing the following characteristics of all mapped priority species flight lines passing through each grid cell:

- Priority species score and the number of individuals associated with each flight line;
- Risk height factor, which considered if the flight was within the Rotor Swept Height; and
- The duration of the flight.

Grid cells within the WEF site boundary without a GCSS did not have any recorded priority species flights passing through from the monitoring survey.

Additional 'Medium Sensitivity' areas were identified by buffering the following important avifaunal features after analysis of incidental record and flight path locations:

- Cultivated lands – the majority of large flocks of Blue Crane were recorded in cultivated lands. A 200 m buffer was applied to afford this species protection from disturbance, as well as when arriving or departing.
- Ridgelines associated with steep slopes and/or rocky habitats frequented by Verreaux's Eagle were buffered by 150 m.

Avifaunal No-Go Areas (Figure 9.6) were identified through the results of the desktop study and monitoring programme and were advised by the recommendations in the report by specialist Andrew Jenkins (Appendix VI) as follows:

- National Freshwater Ecosystem Priority Areas (NFEPA) rivers and wetlands buffers: 200 m
- Nest Site buffers:
  - Verreaux's Eagle nest sites (active): 3 000 m
  - Verreaux's Eagle nest site (inactive): 2 000 m
  - Martial Eagle nest site (active): 5 000 m
  - Peregrine Falcon: 1 000 m
  - Pale Chanting Goshawk: 500 m
  - Jackal Buzzard: 500 m
  - Rock Kestrel: 500 m
  - Rufous-breasted Sparrowhawk: 500 m

The Avifaunal Sensitivity Map as well as the Avifaunal No-Go Areas Map were submitted to the EWFP to inform turbine placement. It was recommended that the hierarchy of sensitivity scores presented in the Bird Sensitivity Map be considered, with preferential turbine placement in areas with Low Sensitivity areas, and decreasing preference through to High Sensitivity areas. While not classified as no-go areas, it was recommended that placement of turbines in grid cells with a High GCSS be avoided. Where two or more sensitivity areas overlap, the layer with the higher sensitivity designation should take preference. No turbines should be placed in Avifaunal No-go Areas.

A bat sensitivity map was compiled for the study boundary area highlighting bat sensitive areas of varying sensitivity classes (Figure 9.7). A description of each class is presented in Table 20.

Table 16 Bat Sensitivity Classifications and Recommendations

Sensitivity Class	Description
Low to Medium	The Low-Medium Sensitivity Areas were: • The remaining areas above the 1440 m, after the identified higher sensitivity classes were delineated. • All areas otherwise not designated with a higher sensitivity Most of these areas are higher lying plateau areas. The reason this is area is classified as Low to Medium, as opposed to just Low is that no one can be certain that the risk of bat fatality is low. Experience from the USA shows that whilst high activity does normally equate to high fatality, low activity does not necessarily equate to low fatality (*pers comm*. Cris Hein, 28 August 2014). Additionally, IWS is monitoring at 5 operational WEFs and all have had bat fatalities to a greater or lesser extent. IWS believes that the bats occurring in the lower valley areas for most of the year and in the harsher weather conditions will move and forage along the higher lying plateaus in optimal low wind speed and warm conditions.
Medium	The Medium Sensitivity Areas were: The Upper Karoo Hardeveld vegetation type, and All areas otherwise not designated with a higher sensitivity below the 1440m contour.

Medium to High	The Medium - High Sensitivity Areas were made up as follows: All potential bat roosts with a 500 m buffer.
High	The High Sensitivity Areas were made up as follows: All FEPA wetlands & rivers with a 500m buffer. Confirmed bat roosts with 1 km

The Environmental Constraints Map (Figure 9.8) presents all buffers identified and described above in one map. Figure 9.9 shows the superimposed proposed layout of the development over the environmental constraints map.

10 CUMULATIVE IMPACTS

10.1 Flora and Fauna Assessment

Impact on Critical Biodiversity Areas and cumulative disruption of broad-scale ecological processes

Transformation within CBAs would potentially disrupt the functioning of the CBA or result in biodiversity loss. In addition, the presence of the facility and associated infrastructure could potentially contribute to the cumulative disruption of broad-scale ecological processes such as dispersal, migration or the ability of fauna to respond to fluctuations in climate or other conditions. There are a number of other renewable energy facilities in the broad area (Figure 10.1) and the cumulative impact of these on habitat loss and the broad scale disruption of landscape connectivity is a potential concern. This impact results from the facility itself and the power line is not considered a significant contributor.

10.2 Wetland and Fresh Water Assessment

The increase in surface run-off velocities and the reduction in the potential for groundwater infiltration is likely to occur, considering that the site is near the main drainage channels and however the annual rainfall figures are low and this impact is not anticipated.

Downstream alteration of hydrological regimes due to the increased run-off from the area. However due to low mean annual runoff within the region this is not anticipated due to the nature of the development together with the proposed layout.

Downstream erosion and sedimentation of the downstream systems and farming operations. During flood events, any unstable banks (eroded areas) and sediment bars (sedimentation downstream). However due to low mean annual runoff within the region this is not anticipated due to the nature of the development together with the proposed layout.

Possible impact on the remaining catchment due to changes in run-off characteristics in the development site. However due to low mean annual runoff within the region this is not anticipated due to the nature of the development together with the proposed layout.

10.3 Avifaunal Assessment

All of the previously mentioned impacts, and particularly those associated with the operational phase of the proposed project, may be intensified to some degree due to the potential cumulative impacts of both WEF phases and/or a number of proposed WEFs within 50 km of the project site. Please note that not all of these projects will reach construction phase. The Umsinde Emoyeni Wind Energy Facility is neighbouring the Ishwati Emoyeni Wind Energy Facility and together these may contribute significantly to habitat fragmentation and disruptions of broad-scale ecological processes such as the dispersal and migration of species in response to fluctuations of local and regional climate. If both facilities are approved they may present a significant barrier to movement of birds, particularly in the north-south direction. The extent of this impact depends on the final turbine layout and numbers and can be reduced if constraints corridors, such as those suggested around the Snyderskraal River in the east of the Ishwati Emoyeni Wind Energy Facility (CSIR 2014),remain free of turbines, and if the number of turbines for each phase is kept to a minimum .

Phase 2: WEF and Grid Connection

The cumulative impact of Phase 2 WEF and Phase 2 Grid Connection are expected to be of the same significance as the individual impacts if the Phase 2 Grid Connection is only approximately 3 km in length (and connects to the Grid Connection for Phase 1). It should therefore not have any significant effect if mitigated as discussed. Should the Phase 2 Grid Connection run to Ishwati or Gamma substation the cumulative impacts may be slightly higher than the individual impacts for habitat destruction, disturbance and displacement, electrocution and power line collisions, but the significance is expected to remain the same for each of these impacts.

Phase 2: WEF and Grid Connection

The cumulative impact of Phase 2 WEF and Phase 2 Grid Connection are expected to be of the same significance as the individual impacts. The Phase 2 Grid Connection will only be approximately 2 km in length and should therefore not have any significant effect if mitigated as discussed.

Phase 1 and 2: WEF and Grid Connections

The cumulative impact of all four components of the proposed development are expected to be higher than the individual impacts, particularly for the operational phase. Depending largely on turbine placement, the combined impact of up to 196 turbines has the potential to affect the viability of local populations. If all no-go and highly sensitive areas are avoided, and if less turbines per phase is adopted, the cumulative impacts of the two WEF phases would be acceptable.

Phase 1 and 2 WEFs and Grid Connections and Ishwati Emoyeni WEF

The significance of the cumulative impact of the two Umsinde Emoyeni phases together with the neighbouring approved Ishwati Emoyeni Wind Farm (should Ishwati be constructed) can be higher than the significance of the individual components. Particularly the operational impacts could be intensified and possibly affect the viability of some species local and regional populations. This will depend largely on final turbine placement and number. It is possible that the cumulative impacts of collision (with turbines and power lines) will have a high significance, particularly on the local populations of key species such as Verreaux's Eagle and Blue Crane. Post-construction monitoring results from both WEF facilities (and all phases) should be combined and analysed collectively in order to identify any regional effects.

Combined Umsinde Emoyeni WEF, Ishwati Emoyeni WEF and Proposed nearby Developments

Currently there are four further wind energy facilities and three solar projects under application within a 50 km radius from the WEF site. Conducting a detailed cumulative impact assessment of all of these facilities together on a regional scale is beyond the scope of the specialist study and would need the input of all developers and specialists working on the abovementioned projects. Such an assessment is best undertaken by appropriate regional or national agencies in the context of strategic planning, and should not be required in the context of assessing a single proposal. In the scope of this study it is therefore difficult to say at this stage what the cumulative impact of all the proposed developments will be on birds because there is no cumulative baseline to measure against. The extent of actual impacts will only become known once a few wind farms are developed and operational data becomes available, and because the developments considered may not all be constructed.

However, at a high level and with medium confidence it can be said that, if all of these facilities are approved and constructed they may present a significant threat to birds. Electrocutions, collisions with powerlines and wind turbines can potentially affect the viability of regional and even national populations, particularly of Verreaux's Eagle and Blue Crane.

The extent of these impacts will depend largely on the final turbine layouts (and PV technologies and layout extents) of each facility which can be reduced if turbine placement is informed by pre-construction monitoring and nest surveys. Corridors, such as those suggested around the Snyderskraal River in the east of the Ishwati Emoyeni Wind Energy Facility (CSIR, 2013) and the high sensitivity areas identified by Smallie (2014), should remain free of turbines.

If all proposed projects implement appropriate mitigation measures as well as post-construction monitoring programmes and share the information gained from these, then the overall significance of the discussed impacts can be reduced. However, the significance of some cumulative impacts is likely to remain high negative even after mitigation

10.4 Bat Assessment

Whilst it is very important to consider the local, regional and national impacts that may be caused by individual developments; it is equally important to consider the cumulative impacts of the facility in light of other similar developments nearby. Figure 10.1 shows all EIA applications for renewable energy projects received by the DEA as at the end of 2014 (DEA, 2015). It is already evident that several other wind and solar developments will be constructed within a 200 km radius of Umsinde, many as close as 30 to 100 km away.

Based on the bat specialists experience at 5 other operational WEFs, several bat species are being killed by wind turbines. Species that occur at Umsinde and surrounds that have been reported as wind turbine fatalities in SA include *Tadarida aegyptiaca, Neoromicia capensis* and *Miniopterus natalensis*. Whilst the fatality thresholds that could lead to population crashes are unknown at this stage due to a lack of bat population level data, multiple fatalities of specific species at numerous WEFs cannot be good news for those specific species. The consequences of bat population declines are decreased pest-insect control by insectivorous bats, decreased pollination and seed dispersal by frugivorous bats and other ecosystem services provided by bats and increased mitigation measures required by WEFs.

Whilst clustering WEFs may have grid infrastructure benefits, these benefits must not come at cost of irreversible negative cumulative environmental impacts. As several WEFs have already been approved for the area surrounding Murraysburg and Victoria West and several more are in the process of submitting applications, monitoring of the construction and operational phase impacts at already approved WEFs must first be conducted to prove that the environmental impacts are not significant, before further facilities in the same area are approved. There should be a staggered approach to the approvals, so learning can adequately inform future approvals. The first phases of developments should inform the mitigation and management strategies for future phases of WEF developments.

10.5 Socio-Economic Assessment

The proposed Ishwati Emoyeni WEF is located immediately to the west of the proposed Umsinde WEF site. The potential for cumulative impacts associated with combined visibility (whether two or more WEF will be visible from one location) and sequential visibility (e.g. the effect of seeing two or more renewable energy facilities along a single journey, e.g. road or walking trail) is therefore high. However, due to the proximity of the two sites the WEFs could be viewed as a single large WEF as opposed to two separate WEFs. While viewing these WEFs as a single large facility, as opposed to separate facilities, does not necessarily reduce the overall visual impact on the scenic character of the area, it does reduce the potential cumulative impact on the landscape. Viewing each of the proposed WEFs as a single, large WEF eliminates the cumulative impacts associated with combined visibility (whether two or more wind farms will be visible from one location) and sequential visibility (e.g. the effect of seeing two or more wind farms along a single journey, e.g. road or walking trail). This therefore reduces the potential cumulative impact of the WEFs on the landscape. The proximity of the WEFs also has the benefit of concentrating the visual impacts on the areas sense of place in to one area as opposed to impacting on a number of more spread out areas.

However, the potential impact of wind energy facilities on the landscape is an issue that does need to be considered, specifically given South African's strong attachment to the land and the growing number of wind facility applications. With regard to the area, a number of WEFs have been proposed in the Western Cape Province. The Environmental Authorities should therefore be aware of the potential cumulative impacts when evaluating applications.

In addition to the potential negative impacts, the establishment of the proposed WEF and other renewable energy projects in the area also has the potential to create a number of socio-economic opportunities for the town of Murraysburg and the BWLM, which, in turn, will result in a positive social benefit. The positive cumulative impacts include creation of employment, skills development and training opportunities, creation of downstream business opportunities. This benefit is rated as High Positive with enhancement.

10.6 Heritage Assessment

The cumulative impact will affect the landscape qualities of the Karoo which is generally considered to be significantly scenic. This area is well known for its wide open spaces, its exposed geology and semi-desert natural qualities. In terms of the larger picture the Karoo is destined to changes. Applications for wind and solar energy are numerous to the extent that if these are all authorised the likelihood are that there will be few regions where there will not be an industrial development on the horizon. The aesthetic qualities of the Karoo generally will irrevocably change. The sense of isolation and wilderness of this unique landscape will be affected and highly compromised in wind farm areas. Oberholzer and Lawson (2015) have indicated that the combination of both phases of the proposed activity will affect the quality of the environment within and around the project area, which combined with the proposed Ishwati Emoyeni will have a strong negative impact on the general character of the region. Although other proposed facilities are some 50 km away and given that turbines will be visible for up to 18 km the amount of landscape affected by the combined clusters of wind farms is 36 linear km out of a linear 50 km. This is a significant impact on the character of the Karoo.

10.7 Noise Assessment

Table 20 defines the noise rating levels at the closest potential noise-sensitive receptors.

Table 17: Noise rating levels at closest potential noise-sensitive receptors, 245 MW Layout (maximum sound power emission levels)

NSD	Phase 1 (dBA)	Phase 2 (dBA)	Cumulative – Phases 1 and 2 (dBA)

1	27.8	36.1	36.7
2	0	25.4	25.4
3	28.2	0	28.2
4	38.5	0	38.5
5	31	9.1	31.0
6	0	37.4	37.4
7	0	36	36.0
8	0	36.3	36.3
9	0	33.4	33.4
10	0	34.1	34.1
11	0	36.9	36.9
12	13.3	39.6	39.6
13	0	26.9	26.9

10.8 Visual Assessment

This is the accumulation of visual impacts in the area, particularly in relation to other existing or proposed energy projects and industrial-type facilities in the immediate area, (see Fig. 10.1).

The proposed Umsinde Emoyeni project would consist of 2 phases, resulting in a total potential maximum of 196 proposed wind turbines, which could have a major visual effect on the local area. In addition, the proposed Ishwati Emoyeni WEF (maximum of 80 proposed turbines) adjacent to the project site, would increase the cumulative visual effect.

Seen together these WEF projects, along with their associated substations and powerlines, could have a significant visual effect on the visual character and scenic resources of the area.

The Victoria West WEF (30 wind turbines), the Noblesfontein WEF, (under construction), and the approved Modderfontein WEF, are all to the west of the N1, about 50 km away, and would not be visible from the Umsinde Emoyeni project area.

11 UPDATED SPECIALIST ASSESSMENT ON REVISED 35 TURBINE LAYOUT

All specialist had input into and a chance to assess the revised layout of 35 turbines. As discussed, the initial layout of 98 turbines, was reduced to 55 turbine, based on the additional 12 months of bird monitoring on the site. All specialists received the 55 turbine layout, and provided an updated assessment and recommendations on the layout. Based on the recommendations and updated sensitivities and buffer areas, this layout was further reduced to 35 turbines. The applicant has removed all turbines out of high sensitive areas (Figure 9.10). This section of the report highlights the findings of the updated specialists assessments based on the 35 turbine layout, including any changes to the cumulative impact assessment of the proposed development. This section should be read in conjunction with Sections 8, 9 and 10 of this report. Specialist Reports can be found in Volume III Part I and Part II.

The Scope of Work and Terms of Reference for the addendum reports include the following:

- Assess the new layout / project description against baseline environment and the assessment that was conducted previously.
- Update the impact assessment as applicable,

The addendum report should also include the following:

- New project description
- Confirmation that the study and the assessment complies with relevant legislation and guidelines;
- Findings of the site visit, if undertaken;
- Updated impact assessment, should any of the assessment rating change and an explanation of the change in rating, this must include the cumulative assessment of the proposed development as well;
- Additional buffers and no go areas, if applicable;
- Confirmation of no-go areas, and buffers;
- Clear indication of what infrastructure is permitted / not permitted in buffer areas (for example, a road may be acceptable to pass through a bat buffer area);
- In indication of which turbines must be moved or which if they are acceptable to keep, and must be micro-sited;
- A reasoned opinion as to whether the proposed project should be authorised; and
- Any conditions that should be included in the environmental authorisation.

11.1 Geology, Soils and Agricultural Potential

The soils and agricultural potential addendum report states that the proposed development of a wind energy facility on the site will have a small impact on agricultural activities as the soils are of low potential and only suited to extensive grazing. The turbine footprints are limited to rocky and shallow soil areas with very limited grazing potential.

The impacts for the new layout and decreased intensity are similar that the original layout out. All recommendations stated in the original report still apply.

11.2 Flora and Fauna

The current specialist statement, when read in conjunction with the original EIA study, fulfils the requirements for the contents of specialist studies as detailed in the 2014 EIA regulations. There are no significant limitations or assumptions that would compromise the results and conclusions of the current studies. Fieldwork took place at a favourable time of year and the results are considered reliable and additional fieldwork at the site would not be likely to reveal any additional features of significance.

In terms of the baseline environment as described in the fauna and flora specialist study (2015), the major change that has occurred since the EIA was submitted is that a new set of CBA maps has been published for both the Northern and Western Cape. Apart from this there have been no changes to the national vegetation map for the area and the habitats described in the EIA study do not change over short time scales and no significant changes in this regard can be expected. The changes to the regional conservation planning is however significant and has implications for the study. The combined Northern and Western Cape CBA map for the study area is illustrated below in Figure 11.1

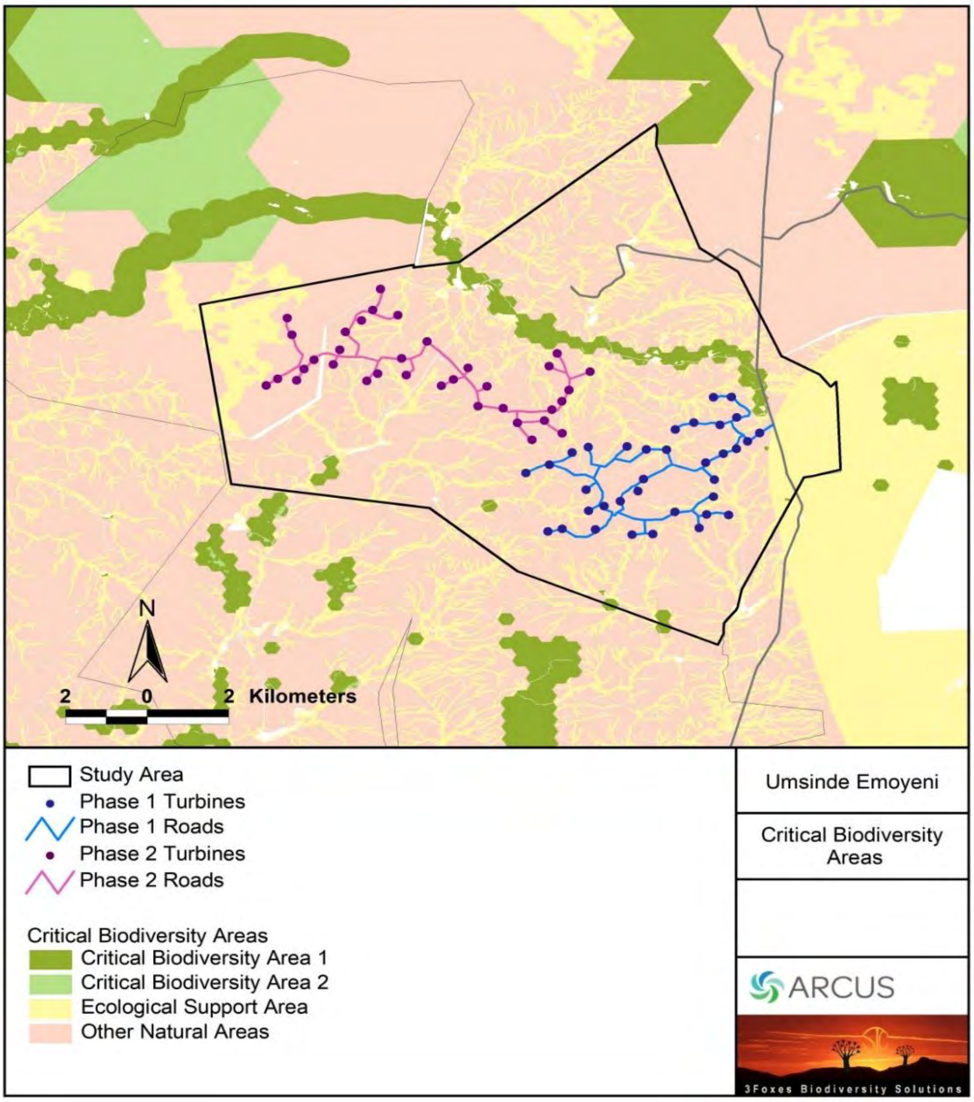


Figure 11.1. Combined CBA map for the study area, taken from the Beaufort West section of the Western Cape 2017 BSP and 2016 Northern Cape Conservation Plan.

There have been significant changes to the CBA since the original EIA study was conducted and while parts of Phase 2 were within CBAs and ESAs, the extent of these areas has been significantly reduced. Under the final revised layouts, there are no turbines within CBAs or within ESAs. There is minimal impingement of drainage line ESAs by access roads and significant impact on ESAs is not likely. Overall, due to the changes in the CBA maps as well as changes to the layout, the impact on CBAs has been reduced and no significant impacts on CBAs is likely to occur under the layouts provided.

11.2.1 Updated Impact Assessment

The assessed impacts of the Umsinde Phase 1 WEF as assessed in the original EIA study are considered here in terms of whether or not any changes to the assessed impacts are justified as a result of the changes to the layout of the facilities. A summary of the revised impacts of the development is provided below in Table 11.1. The original impacts are generally considered representative of the likely impacts of the development. Although some of the pre-mitigation impacts could justifiably be reduced for the current assessment, the original layout is considered to represent the pre-mitigated layout and as such the pre-mitigation impacts are not altered. However, as the revised layouts are considered to represent mitigated layouts which have made significant attempts to reduce and avoid sensitive areas as far as possible, these are subject to reconsideration. In this regard, it is clear that the impacts on CBAs and broad-scale processes has been significantly reduced and this is now considered to be Low after mitigation. Although some of the other impacts, in particular impacts on vegetation during construction and fauna during operation are reduced from the original impacts, the assessment methodology is coarse and does not result in a decrease from Medium to Low in either case. This is largely because although these impacts would be of Local influence only, they would be of Medium intensity and operate over the long-term, with limited scope for avoidance. As such, compared to the original assessment, only the cumulative impacts are reduced here from the original assessment and all the other assessed impacts are considered equivalent post-mitigation. The recommended mitigation measures as described in the original study have been reviewed and no changes are recommended in this regard. As such, all the stipulated mitigation and avoidance measures listed remain valid for the revised layout, but no additional mitigation measures are recommended either.

Table11.1 Revised summary assessment of impacts associated with the Umsinde Emoyeni wind farm development.

Impact		Consequence	Probability	Significance	Status	Confidence
Planning & Construction Phase						
Impact 1: Impacts on vegetation and listed or protected plant species resulting from construction activities	Before Mitigation	High	Probable	High	– ve	High
	After Mitigation	Medium	Probable	Medium	– ve	High
Impact 2: Alien Plant Invasion Risk	Before Mitigation	Medium	Probable	Medium	– ve	High
	After Mitigation	Very Low	Probable	Low	– ve	High
Impact 3: Increased Erosion Risk	Before Mitigation	Medium	Probable	Medium	– ve	High
	After Mitigation	V Low	Probable	V Low	– ve	High
Impact 4. Direct faunal impacts during construction	Before Mitigation	Medium	Probable	Medium	– ve	High
	After Mitigation	Low	Probable	Low	– ve	High
Operational Phase						
Impact 1. Alien plant invasion risk	Before Mitigation	Medium	Definite	Medium	– ve	High
	After Mitigation	Low	Probable	Low	– ve	High
Impact 2. Increased erosion risk	Before Mitigation	Medium	Definite	Medium	– ve	High

	After Mitigation	Low	Probable	Low	– ve	High
Impact 3 Faunal impacts during operation	Before Mitigation	Medium	Probable	Medium	– ve	High
	After Mitigation	Medium	Probable	Medium	– ve	High
Decommissioning Phase						
Impact 1. Alien plant invasion risk	Before Mitigation	Medium	Definite	Medium	– ve	High
	After Mitigation	Low	Probable	Low	– ve	High
Impact 2. Increased erosion risk	Before Mitigation	Medium	Definite	Medium	– ve	High
	After Mitigation	Low	Probable	Low	– ve	High

The major change that has resulted from the revised layout is the large reduction in the number of turbines. This has significantly reduced the footprint of the proposed projects both in terms of the footprint areas required for the turbines, as well as the extent of access roads required which is usually the dominant source of impact on the terrestrial environment from wind farm development. The reduction in access roads, which are seen as being of particular significance for terrestrial impacts have changed as follows:

- The Phase 2 road network has been reduced from 100.9 km down to 29.63 km.

The revised layout has been carefully inspected and reviewed to assess potential impacts to sensitive features at the site. Compared to the original layout, significant improvements are evident with regards to avoidance of sensitive ecological features at the site. There are no turbines in no-go areas or areas considered unsuitable for turbine placement. Apart from the large reduction in the extent of the road network, which is seen as a positive step, there are no roads which traverse no-go areas. While there are some roads which traverse minor drainage systems, crossings have been reduced as far as possible and the remaining crossings are not avoidable and are considered acceptable. As such, the revised layouts are considered well-mitigated and will significantly reduce the impact of the development on the terrestrial environment compared to the original project layouts.

11.3 Wetlands and Freshwater

The study site is located approximately 35km north west of the Murraysburg, with the WEF site falling within three quaternary catchments of the Gamtoos Water Management area (Quaternary catchments, L21C, L21D & L21E) (Figure 11.2). Several main stem rivers are found within these catchments which form part of the Brak River. These tributaries include:

- Skietkuilspruit
- Brak River
- Snynderskraal River
- Buffels River and
- Several unknown tributaries

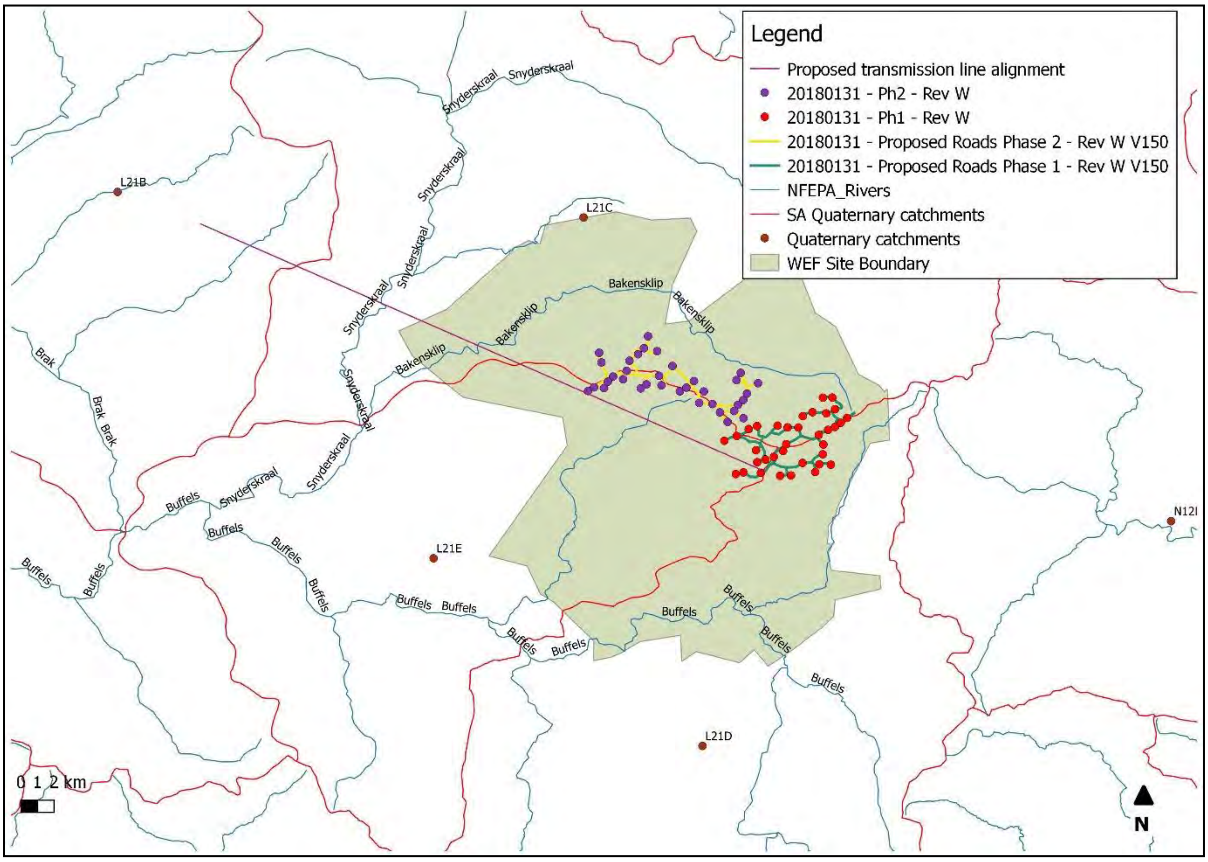


Figure 11.2: Project study area indicating various quaternary catchments and major rivers (NFEPA & DWS)

The proposed development from an aquatic vegetation point of view is dominated by species associated with the Nama Karoo vegetation ecosystem. These systems are thus usually devoid of any trees with strict riparian or wetland affiliations and this is due to the largely ephemeral nature of the rivers / water courses within the region. However, the larger systems, such as those listed above have a higher Mean Annual Runoff and thus contain a woody layer component within the riparian floodplain areas which are dominated by *Vachellia karroo*, *Searsia lanceolata* and *Combretum* species.

A large number of these systems are also Alluvial systems, i.e. dry sandy river beds, that can have extensive floodplains (Figure 11.3). For the purposes of this project, these areas have been avoided by any infrastructure required for the development of the WEF.

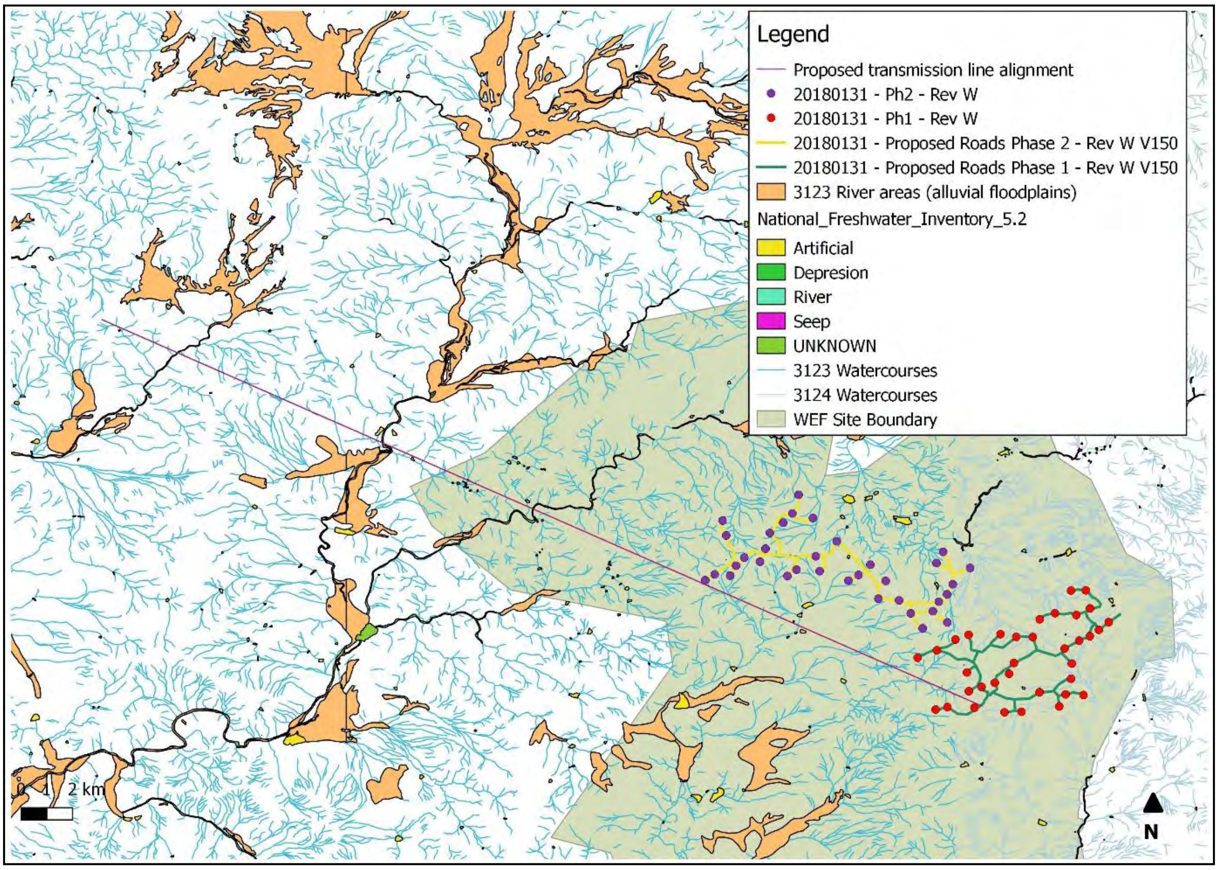


Figure 11.3: The study area in relation to the various surrounding river (including alluvial fans and water courses) and identified wetland areas.

Based on the 6 levels of the National Wetland Classification System, these systems are typical of Inland Systems (Level 1), within the Drought Corridor Ecoregion (Level 2).

Wetland landscape units (Level 3) were thus valley floors (riparian / palustrine) or un-channelled valley bottom hydrogeomorphic units (Level 4). Several of these have been indicated in the National Wetland Inventory, however upon closer inspection during the site visit, and the National Freshwater Priority Ecosystems Areas (NFEPA) database (Nel *et al.*, 2011) most of the indicated wetlands are man-made systems. Based then on this and field observations no natural wetlands would be affected by the proposed WEF or transmission line alignment.

Within the remaining waterbodies, the low annual rainfall within the region the water courses infrequently contain any surface runoff or open water (Level 5), but would remain important habitat or refugia within a landscape when flowing or inundated. These were thus classified as riverine drainage lines, alluvial river beds and small to medium sized water courses. The majority of the water course crossings will occur on the smaller drainage lines and water courses and will not impact on the large alluvial systems.

Of interest is the National Freshwater Ecosystems Priority Areas project (Nel *et al.*, 2011), several important catchments (sub-quaternaries or SQ) have been earmarked, based either on the presence of important biota (e.g. rare or endemic fish species) or the degree of riverine degradation, i.e. the greater the catchment degradation the lower the priority to conserve the catchment. The important catchments areas are then classified as Freshwater Ecosystems Priority Areas or FEPAs.

The study area systems are largely functional, however significant impacts as a result of current land use practices and alien trees (e.g. *Salix babylonica*) do occur. This was confirmed for each of the affected reaches located within the development footprint and in particular the areas that would be crossed by the proposed road layout shown in Figure 1.3 and Figure 7.1. In other words, the systems observed are natural, with small or narrow riparian zones, dominated by *Searsia lancea* and *Vachellia karroo.* The only obligate species observed include small areas of *Juncus rigidus* and *Phragmites australis* associated with small pools created by road culverts found throughout the study area.

The present day impacts have affected the Ecological Importance (EI) and Ecological Sensitivity (ES) of these systems, with most being rated as Moderate (EI & ES).

The only exception being Sub-Quaternary Catchment, 6810 (L21D), where EI was rated as High. This was due to the importance of this catchment in being a Fish Corridor and containing downstream habitat for the various listed fish species discussed above, i.e. high scores for fish rarity metrics for this catchment.

The study area contains several of these FEPAs, which are based on either their role in containing fish species of special concern or their potential as support habitats, associated with main stem rivers. These habitats include lower and upper mountain foothills, important for the Chubbyhead barb (*Barbus anoplus*) and *Pseudobarbus asper* (Smallscale redfin) fish species. The later species is Endemic to South Africa and is listed as Endangered.

Presently there are no prescribed aquatic buffers other than those proposed in this portion of the Western Cape, thus the, recommendations by Desmet and Berliner (2007) will be applied as these are becoming more widely accepted (Table 11.2). These are shown below, to make the engineers and contractors aware of these buffers during the planning phase, i.e. construction, associated batch plants, stockpiles, lay down areas and construction camps should avoid these buffer areas i.e. 32m for this development (Figure 11.4).

Table 11.2: Recommended buffers for rivers, with those applicable to the project highlighted in blue

River criterion used	Buffer width (m)	Rationale
Mountain streams and upper foothills of all 1:500 000 rivers, i.e. rivers mapped at this scale by DWS	50	These longitudinal zones generally have more confined riparian zones than lower foothills and lowland rivers and are generally less threatened by agricultural practices.
Lower foothills and lowland rivers of all 1:500 000 rivers i.e. rivers mapped at this scale by DWS	100	These longitudinal zones generally have less confined riparian zones than mountain streams and upper foothills and are generally more threatened by development practices.
All remaining 1:50 000 scale streams, i.e. all systems that appear on the topo-cadastral maps	32	Generally smaller upland streams corresponding to mountain streams and upper foothills, smaller than those designated in the 1:500 000 rivers layer. They are assigned the riparian buffer required under South African legislation.

The impacts as assessed during for the 98 turbine layout has not changed nor has the significance rating. The following direct and indirect impacts were assessed with regard the riparian areas and water courses:

- Impact 1: Loss of riparian systems and water courses

- Impact 2: Impact on riparian systems through the possible increase in surface water runoff on riparian form and function
- Impact 3: Increase in sedimentation and erosion
- Impact 4: Potential impact on localised surface water quality
- Impact 5: Overall cumulative impact

The proposed layouts for the facility would seem to have limited impact on the aquatic environment as many of the proposed structures will avoid the delineated watercourses with the exception of the 31 water course crossings. Based on the condition of some of the present crossings, the project thus presents an opportunity to improve the flow and erosion protection were existing culverts / crossings do exist.

No aquatic protected or species of special concern (flora) were observed during the site visit, as well as any natural wetlands. Therefore, based on the site visit the significance of the impacts assessed for the aquatic systems after mitigation would be LOW. This is based on the assumption that the projects will have a limited impact on the aquatic environment and with monitoring of flows, erosion and sedimentation, although unlikely, downstream fish populations will not be impacted upon. This is also coupled to the fact that all of the project components have avoided the alluvial systems.

Figure 11.4, below further indicates the affected water courses crossing points and those that would trigger the need for a Water Use License application (a potential GA) in terms of Section 21 c and i of the National Water Act, should any construction take place within these areas. However, during the micro-siting process several of the 31 crossings could be reduced by moving some of the roads just outside of the buffer, i.e. these are not actual river crossing, and the proposed the road is only within the buffer (Figure 11.4).

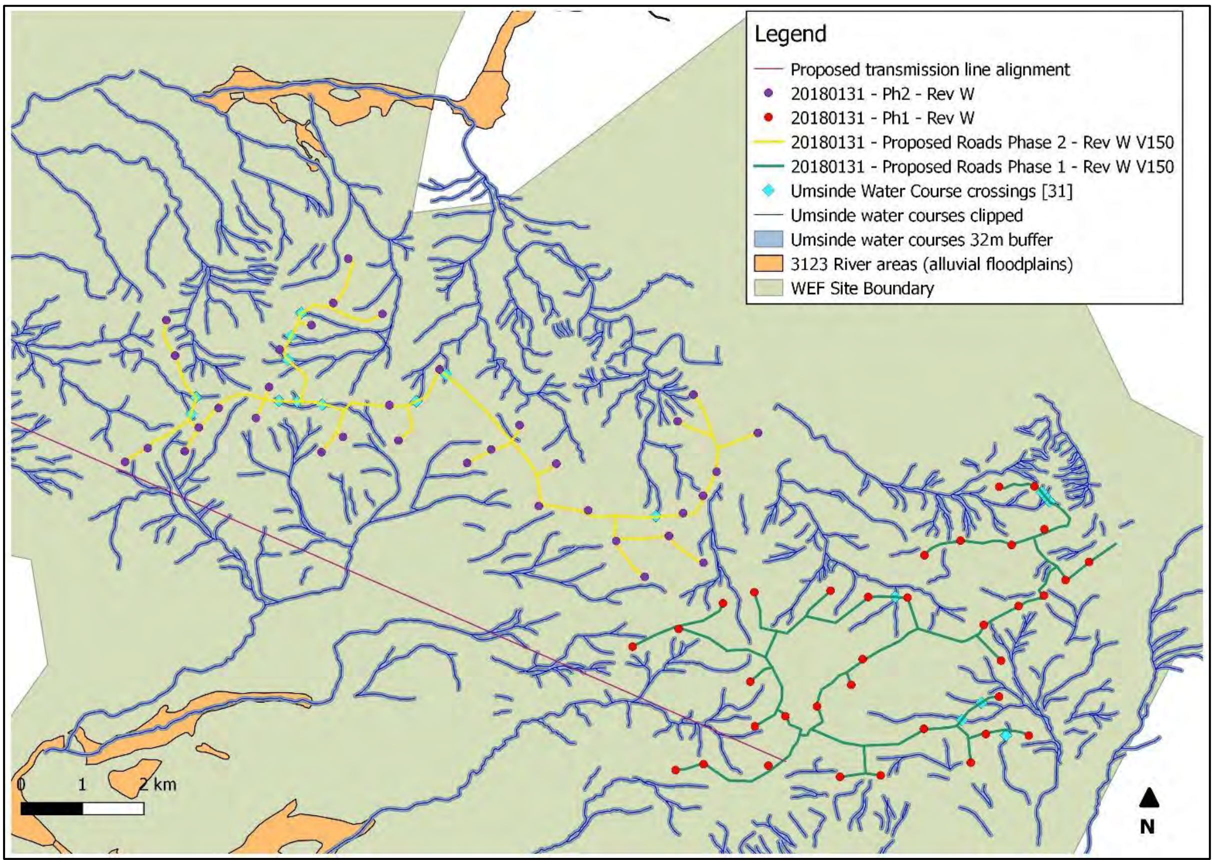


Figure 11.4: Map indicating the various water courses and the 32m buffer, which has resulted in 31 crossings for both phases.

11.4 Avifauna

Between October 2013 and October 2014 Arcus conducted avifaunal monitoring ('the initial monitoring') in line with the applicable guidelines (and in some instances above the minimum requirements) over a period exceeding 12 months on the WEF site. The results of this *initial* monitoring programme were presented in various reports, including seasonal progress reports, a scoping report, and culminating in the final Avifaunal Specialist Report (Pearson, 2015)[27]. Pearson (2015) identified Verreaux's Eagle as the main concern regarding potential avifaunal impacts of the proposed project. The decision to initiate additional monitoring was taken by the applicant following comments received from Birdlife South Africa (BLSA) and Interested and Affected Parties (I&APs) on the final Environmental Impact Assessment (EIA) report, comments on the final Avifaunal Specialist Report, meetings between these parties and the specialists, and recommendations made by the specialists.

This Updated Avifaunal Impact assessment (which serves as an addendum to Pearson, 2015) presents the survey design, methodology and results of the additional one year of pre-construction monitoring (the "2016/17 monitoring"). These results are then carefully considered, along with the results of the initial monitoring and all the findings from a thorough desk-based study (presented in Pearson, 2015), and an updated Impact Assessment is presented. This updated assessment is based on a revised layout (November 2017), which is the result of an iterative design process conducted by EWFP, and considers the latest available information regarding bird mortalities at operational WEFs in South Africa.

Through an interactive design process during the EIA process, the majority of the WEF site initially surveyed during 2013/2014 was initially excluded from the proposed development. At the outset of the additional monitoring, the turbine layout consisted of two 140 MW phases in the north and north east of the WEF site (Figure 1.1), of up to 98 wind turbines each.

The purpose of the additional avifauna monitoring was to gather more detailed data regarding key species particularly Verreaux's Eagle while simultaneously addressing various comments and concerns raised by BLSA and I&APs. The primary aims of the additional monitoring were therefore to:

- Gain a better understanding of the movement of Verreaux's Eagle around the proposed turbine area and at selected nest sites within 7.5 km from turbine locations;
- Gain a better understanding of inter-annual variation in abundance, movements and activity of Verreaux's Eagle, Blue Crane and migratory species such as Amur Falcon and Lesser Kestrel;
- Increase coverage of vantage point surveys in areas where there were potential sampling gaps in the initial monitoring;
- Confirm the status of nests; and
- Monitor the movement of birds dispersing from a sample of nests.

11.4.1 Additional Monitoring Survey Design and Methods

The survey design and method was developed by Arcus at the start of the surveys (June 2016) to be in line with the applicable best practice guidelines[28] where possible, while also considering the methodology used by Pearson (2015), so that the data is comparable and

[27] Avifaunal Specialist Report. Umsinde Emoyeni Wind Energy Facility Phase 1 & 2 and Associated Electrical Grid Connection Phase 1 & 2, Western Cape and Northern Cape. September 2015.

[28] Best Practice Guidelines for assessing and monitoring the impact of wind energy facilities on birds in southern Africa (Jenkins *et al.* 2015).

compatible, and can be combined with the data collected during the initial 12 month programme. The methodology was designed in consultation with Lucia Rodrigues (who through her involvement with the Western Cape Black Eagle Project has been monitoring Verreaux's Eagle populations throughout the Western Cape since 2004) as well as BLSA and was focussed on Verreaux's Eagle and the proposed turbine positions at the inception of the programme.

Four seasonal surveys, one specialist cliff nest survey and two focussed 'Nest Vantage Point (NVP)' surveys were conducted between July 2016 and April 2017 (Table 11.3). The seasonal surveys consisted of vantage point monitoring, driven transects, focal sites and incidental observations. The specialist cliff nest survey in winter was conducted to locate additional nests (additional to those found during the initial monitoring in 2013/2014). The NVP surveys were conducted to monitor and record activity around active nest sites with survey methods similar to those of vantage point monitoring detailed below.

Table 118.3: Seasonal Survey Dates

Survey	Dates
Winter Survey	01 – 09 July 2016
Cliff Nest Search	02 – 04 July 2016
Spring Survey	18 - 24 September 2016
Nest Vantage Point Survey 1	04 – 06 October 2016
Summer Survey	17 – 23 January 2017
Nest Vantage Point Survey 2	04 – 07 April 2017
Autumn Survey	21 – 27 April 2017

11.4.2 Summary of Results

A total of 100 species were recorded by the field team (across all survey methods and while traversing the WEF site) during the final autumn survey. This was less than in spring (117 species) and summer (118 species), but more than in winter (79 species).

Across all the seasonal surveys, the total number of recorded species was 158. These included 10 Red Data species and 24 priority species, two of which (African Rock Pipit and Black Harrier) are endemic (Table 11.4). Of the Red Data species recorded, Blue Crane, Martial Eagle, Verreaux's Eagle, Karoo Korhaan and African Rock Pipit were recorded during each of the four seasonal surveys. Generally the most abundant and regularly recorded priority species were Jackal Buzzard, Blue Crane, Verreaux's Eagle, Grey-winged Francolin, Pale Chanting Goshawk, African Harrier Hawk, Karoo Korhaan, Northern Black Korhaan, and African Rock Pipit.

Table 11.4: Regional Red Data, Priority and Endemic Species recorded during the Winter, Spring, Summer and Autumn Surveys

Species	Status (Taylor *et al.* 2015)	Priority Species Score	Endemic*	Winter	Spring	Summer	Autumn
Bustard, Ludwig's	EN	320		X	X	X	
Buzzard, Jackal		250	X	X	X	X	X

Species	Status (Taylor *et al.* 2015)	Priority Species Score	Endemic*	Winter	Spring	Summer	Autumn
Buzzard, Steppe		210				X	
Crane, Blue	NT	320		X	X	X	X
Eagle, African Fish		290		X	X		X
Eagle, Black-chested Snake		230		X			
Eagle, Booted		230			X	X	
Eagle, Martial	EN	350		X	X	X	X
Eagle, Verreaux's	VU	360		X	X	X	X
Falcon, Lanner	VU	300		X		X	
Francolin, Grey-winged		190	X	X	X	X	X
Goshawk, Pale Chanting		200		X	X	X	X
Harrier, Black	EN	345	X		X	X	
Hawk, African Harrier		190		X	X	X	X
Kestrel, Greater		174		X		X	
Kite, Black-shouldered		174		X			
Korhaan, Karoo	NT	240		X	X	X	X
Korhaan, Northern Black		180		X	X	X	X
Owl, Cape Eagle-		250			X		
Owl, Spotted Eagle-		170				X	X
Pipit, African Rock	NT	200	X	X	X	X	X
Secretarybird	VU	320			X	X	
Sparrowhawk, Rufous-breasted		170			X		
Stork, Black	VU	330			X		

Appendix I (of the bird specialist report – Volume III, Part 1 and 2) also shows that a total of 24 endemic or near-endemic species were recorded. While some of these were larger birds and priority species (e.g. Grey-winged Francolin and Black Harrier), the majority are small passerines the most abundant of which and/or regularly observed included: Cape Bulbul, Fairy Flycatcher, Large-billed Lark, Karoo Prinia, Pied Starling, Grey Tit, Southern Double-collared Sunbird, Namaqua Warbler, and the *Near-Threatened* African Rock Pipit.

Generally the highest diversities and abundances of small passerine species were restricted to drainage lines, particularly where relatively dense riparian scrub habitat existed. The open plains and plateaux were frequented mainly by larks, pipits, chats, and korhaans. Raptors were generally observed flying over all habitat types. Key foraging areas for raptor species such as Verreaux's Eagle, Jackal Buzzard and Rock Kestrel were generally observed along ridges and cliff faces at higher altitude VPs, with flight paths often occurring along ridgelines. In contrast, Blue Crane, korhaans and bustards were observed foraging on the lower altitude plains. Birds of the family *Corvidae* (crows and ravens) were abundant with White-necked Raven, in particular, being one of the most regularly observed larger species.

Generally waterbirds were concentrated around farm dams and were moderately abundant with various waterbird and waterfowl species observed at Swaelkrans Dam. The importance of farm dams for avifauna in the area was established by the initial monitoring, and these features have been buffered accordingly. It was also considered that there would be movement of these species across the WEF site, from dam to dam. VP monitoring did not pick up high levels of waterbird/waterfowl movements, and no clear 'fly ways' could be identified, apart from the river upstream of Swaelkrans dam. It is important to note though that many of these species fly before dawn and after dusk, and may these nocturnal and crepuscular movements may have been missed.

Although not a red data species or a priority species, the Rock Kestrel population of the area remains substantial, and the species was abundant in 2016/17. This species has been known to collide with turbines in South Africa (pers. Obs; Ralston-Paton et al. 2017), and is therefore potentially at risk. Some protection can be obtained by buffering the prominent cliff and ridgeline habitats as well as the identified nest sites of this species.

11.4.3 Comparison with 2013/2014 monitoring data

While direct and detailed comparisons of the data are not possible, primarily due to differing methods used (including different VP locations) and different sample effort, some important high level observations and comments can be made when comparing the 2013/14 and 2016/17 data sets, as follows:

- A combined total of 181 species was recorded in and around the WEF and control sites during the 2013/14 programme. This included 29 priority species 13 Red Data species. All 10 Red Data species recorded in 2016/17 were recorded in 2013/14, as well as Southern Black Korhaan[29] (Vulnerable), Double-banded Courser (Near-threatened), Greater Flamingo (Near-threatened) and Kori Bustard (Near-threatened). The numbers of recorded priority species during both programmes are considered high (in the specialists' experience), compared with other sites in South Africa.
- Passage rates of target species from vantage points were higher in 2016/17. In 2013/14 the overall average ± SD passage rate for the WEF was 0.97 ± 2.02 target birds per hour of observation, while in 2016/17 the average passage rate was 1.51 ±2.49.
- Raptors accounted for 80.43 % of recorded flight paths in 2013/14, and 81.2 % of recorded flight paths in 2016/17.
- Verreaux's Eagle, Jackal Buzzard, Rock Kestrel and Blue Crane were the species most regularly recorded from VPs during both monitoring programmes.
- Verreaux's Eagle was the most frequently recorded target species and its activity was regarded as high in both programmes, although it was slightly higher in 2016/17. In approximately 895 hours of VP monitoring on the WEF site in 2013/14, 252 flight paths were recorded for this species. This equates to approximately 0.28 flights per hour. In 480 hours of VP monitoring on the WEF site in 2016/17, 149 flight paths were recorded, which equates to approximately 0.31 flights per hour.
- No new Verreaux's Eagle nests were located in 2016/17.
- Blue Crane was more numerous and widespread in 2016/17. For example, 54 incidental records were made of Blue Crane in 2013/14 and 116 were made in 2016/17 (during less days on site). Whereas in 2013/14, the majority of records for this species were in the far south, and beyond the WEF site boundary, in 2016/17 the species was observed in higher numbers in the north of the WEF site (although it was present throughout). It is possible that the increase in numbers of this species in 2016/17 is due to inter-annual variation in climatic conditions (e.g. rainfall) and food availability. Another contributing factor may be the increased effort in certain areas favoured by this species (resulting in more records – possibly of the same birds) during the 2016/17 monitoring
- No Lesser Kestrel or Amur Falcon were observed in 2016/17. Following the initial monitoring, there was concern raised by I&APs that these species may have been missed due to inter-annual variation and timing of surveys. However, the 2016/17 surveys (which included surveys in January 2017) confirmed that the site is currently unlikely to be important for these species (although this could change in the future due to unforeseen climatic changes and changes to prey availability).

11.4.4 Updated Impact Assessment

The potential impacts during the construction phase of the proposed development has not changed from the original 2015 assessment. The mitigation measures and recommendations as mentioned remain.

[29] It is possible that records of this species in 2013/2014 were miss-identifications of Northern Black Korhaan by the field team.

During the operational phase there is no change to the assessment of power line collisions and disturbance and displacement. The significance rating for electrocution has changed to low.

Electrocution of birds from electrical infrastructure including overhead lines is an important and well documented cause of unnatural bird mortality, especially raptors and storks (APLIC 1994; van Rooyen and Ledger 1999). Electrocution may also occur within newly constructed substations. Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (van Rooyen 2004). Electrocutions are therefore more likely for larger species whose wingspan is able to bridge the gap such as eagles or storks. Various large raptors (such as Martial Eagle, Verreaux's Eagle and African Fish-Eagle), susceptible to electrocution (particularly in the absence of safe and mitigated structures) occur on the WEF site.

The extent of the impact is local and restricted to the WEF. As the result of the impact is likely mortality of a number of birds the intensity is considered high and the duration long-term. Since electrocution is known to affect many species in South Africa the impact is possible to occur without mitigation, resulting in a medium significance. If the majority of all new powerlines on the WEF site (i.e. those connecting the turbine strings to the on-site substation) are buried, and any new overhead power line sections are of a bird-friendly design as detailed the table below, the probability of electrocution occurring can be reduced to improbable, resulting in an impact of Low significance for each phase separately.

WEF Phase 2 Operational Phase: Impact Assessment for Electrocution

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Local 1	High 3	Long-term 3	High 7	Possible	Medium	Negative	High
Essential mitigation measures: • New powerlines on the WEF site (i.e. those connecting the turbine strings to the on-site substation) should be buried wherever possible • Any overhead power lines must be of a design that minimizes electrocution risk by using adequately insulated 'bird friendly' monopole structures, with clearances between live components of 2 m or greater.								
With mitigation	Local 1	High 2	Long-term 3	Medium 6	Improbable	Low	Negative	High

There was no change to collisions with wind turbines. The impact was re-assessed, and the values for extent and intensity after mitigation were adjusted. The resultant significances of the impact before and after mitigation remained the same at Very High and Medium respectively. The recommended mitigation measures were updated, particularly because the avifaunal buffer map has been updated.

WEFs can have adverse impacts on avifauna through the collision of birds with moving turbine blades. A number of factors influence the number of birds impacted by collision, including:

- Number of birds in the vicinity of the WEF;
- The species of birds present and their flying patterns and behaviour;
- The design of the development including the turbine layout, height and size of the rotor swept area.

It is important to understand that not all birds that fly through the WEF at heights swept by rotors automatically collide with blades. In fact avoidance rates for certain species have proven to be extremely high. In a radar study of the movement of ducks and geese in the vicinity of an off-shore wind facility in Denmark, less than 1% of bird flights were close enough to the turbines to be at risk, and it was clear that the birds avoided the turbines effectively (Desholm & Kahlert 2005). Whilst avoidance rates for SA species are currently unknown due to the lack of data, comparisons can be drawn between functionally similar species, for example Verreaux's Eagle with Golden Eagle, in order to inform an assessment.

The majority of international studies on collisions caused by wind turbines have recorded relatively low mortality levels (Madders & Whitfield 2006). This is perhaps largely a reflection of the fact that many of the studied wind farms are located away from large concentrations of birds. It is also important to note that many records are based only on finding carcasses, with no correction for carcasses that were overlooked or removed by scavengers (Drewitt & Langston 2006). Relatively high collision mortality rates have been recorded at several large (particularly in terms of turbine numbers), poorly-sited wind farms in areas where large concentrations of birds are present (including IBAs), especially among migrating birds, large raptors or other large soaring species, e.g. in the Altamont Pass in California, USA (Thelander & Smallwood 2007), and in Tarifa and Navarra in Spain (Barrios & Rodrigues 2004).

Although large birds with poor manoeuvrability (such as cranes, flamingos, korhaans, bustards and Secretarybird) are generally at greater risk of collision with structures (Jenkins *et al*. 2015), it is noted that these classes of birds (unlike raptors) do not feature prominently in literature as wind turbine collision victims. It may be that they avoid wind farms, resulting in lower collision risks, or that they are not distracted and focussed on hunting and searching the ground while flying, as is the case for raptors.

Collisions of various bird species with turbine infrastructure (including the tower) have been observed recently in South Africa (pers. Obs). To date a total of 6 Verreaux's Eagle mortalities at wind farms in South Africa have been recorded (BLSA, 2017). Three of these Verreaux's Eagle mortalities were from collisions with operational wind turbines in May 2015 at one WEF in the Eastern Cape (Smallie 2015). The fatalities were unexpected as they occurred on relatively flat topography a considerable distance (at least 3.5km) from suitable Verreaux's Eagle breeding habitat, and pre-construction bird monitoring by Smallie (2015) on the site recorded 'low Verreaux's Eagle flight activity'. Without seeing and analysing the detailed data collected by Smallie (2015) it's difficult to quantify what is meant by 'low activity', as this may be a relative description. However, what is relevant is that it has been confirmed that this species collides with turbines and that collisions may not necessarily occur where predicted, and that they can occur away from areas perceived to be preferred use areas. This information has reduced the confidence with which we assessed collision impacts based on perceived sensitivities for this species (e.g. nest sites and ridgelines in the case of Verreaux's Eagle).

Due to the high observed density of Verreaux's Eagle nests in the broader Murraysburg area mortalities could create a 'sink-hole effect', where a dead bird is replaced by another, which also collides, and so on, and in this way the impact would be able to affect the regional population. Other Priority species or raptors at most risk of collision with turbines are Rock Kestrel, Steppe Buzzard and Jackal Buzzard, and to a lesser extent Martial Eagle, and Blue Crane.

The duration of the impact will be at least for the operational phase of the facility and the intensity of the impact is high. In terms of the Arcus avifaunal specialist's experience, the WEF site has relatively high levels of Verreaux's Eagle, Jackal Buzzard and Rock Kestrel flight activity, and therefore collisions of these species are probable. The resulting significance of this impact is very high for each phase separately if unmitigated. The impacts for Phase 1 and 2 are expected to be similar and of equal significance.

WEF Phase 2 Operational Phase: Impact Assessment for Wind Turbine Collisions

<table>
<tr><th></th><th>Extent</th><th>Intensity</th><th>Duration</th><th>Consequence</th><th>Probability</th><th>Significance</th><th>Status</th><th>Confidence</th></tr>
<tr><td>Without mitigation</td><td>Regional
2</td><td>High
3</td><td>Long-term
3</td><td>Very High</td><td>Probable</td><td>Very high</td><td>Negative</td><td>Medium</td></tr>
<tr><td colspan="9">Essential mitigation measures:
No turbines may be constructed within Avifaunal No-go Buffers described in Section 2.6. Note: This requirement has been adhered to in the current proposed layout.
The hierarchy of sensitivity scores presented in the combined Flight Sensitivity Map should be considered, with preferential turbine placement in areas of Low Sensitivity, and decreasing preference through to High Sensitivity areas. Where two or more sensitivity areas overlap, the layer with the higher sensitivity designation should take preference.
Develop and implement a carcass search programme for birds during the first two years of operation as a minimum, in line with the South African monitoring guidelines, and again at least in year 5, 10, 15, 20 and 25. All constructed turbines (not the minimum number allowed by the guidelines) must be regularly (i.e. at least weekly, or more often if advised by the results of scavenger removal trails) searched for carcasses.
Develop and implement a two year post-construction bird activity monitoring program that mirrors the pre-construction monitoring surveys completed by Arcus and is in line with the South African post-construction monitoring guidelines. This program must include thorough and ongoing nest searches and nest monitoring. This program should be enhanced to include sampling during dusk and dawn.
A GPS/Satellite tagging study should be implemented to monitor the birds, and to establish the true ranges, and how the birds respond to the presence of turbines. Birds from at least three of the eagle territories closest to proposed turbines should be tagged and monitored.
Onsite and off-site habitat management. A habitat management plan must be developed which aims to prevent an influx/increase in preferred prey items (e.g. Dassies) in the turbine area due to the construction and operation activities, while improving raptor habitat and promoting prey availability within the core 3 km buffers around nest sites (i.e. away from the turbine site).
Frequent and regular review of operational phase monitoring data (activity, carcass and GPS/satellite tracking) and results by the bird specialist. This review should also establish the requirement for continued monitoring studies throughout the operational and decommissioning phases of the development. Such operational monitoring may be required beyond the first two years as stipulated as the minimum in point 3 above).
The above reviews should strive to identify sensitive locations at the development including turbines where high mortality is observed and areas of increased collisions with power lines that may require additional mitigation. If unacceptable impacts are observed (as agreed upon by the bird specialist in consultation with BLSA, applicable species experts, and EWT)), the specialist should conduct a literature review specific to the impact (e.g. collision and/or electrocution) and provide updated and relevant mitigations to be implemented. The developer must make financial allowances for additional mitigation measures.
The following may need to be considered if their effectivity is proven and appropriate for this project, and suitable financial allowances should be made for:
Using deterrent devices (e.g. visual and noise deterrents)
Deterrent and/or shutdown systems e.g. DT Bird and Radar Assisted Shutdown on Demand (RASOD) e.g. BIRDTRACK to reduce collision risk.
Identify options to modify turbine operation to reduce collision risk.

</td></tr>
<tr><td>With mitigation</td><td>Regional
2</td><td>Medium
2</td><td>Long-term
3</td><td>High
7</td><td>Possible</td><td>Medium</td><td>Negative</td><td>Medium</td></tr>
</table>

The most effective mitigation for collision impacts currently available is wind farm placement, as well as specific turbine placement within a WEF to avoid high use areas. The Umsinde Emoyeni EIA process has evidenced this with turbine placements being reduced from 196 to 70 across the two phases. Turbine locations are also omitted from all identified high-impact areas. In summary: recommendations put forward by the specialist have been adopted. While not yet tested in South Africa, deterrent devices and shut-down on demand strategies have been implemented internationally. Foss *et al.* (2017) found monochromatic LEDs that specifically target avian photoreceptors could provide a useful tool to divert raptors from hazardous situations, while in Scotland trials are underway by Scottish Natural Heritage (SNH) using laser beams to deter Sea Eagles from feeding on lambs[30]. Tome *et al*. (2017) found that a Radar Assisted Shutdown on Demand (RASOD) system at the Barão de São João wind farm in Portugal's Sagres region resulted in zero mortality of soaring birds over five consecutive autumn migratory seasons. While such strategy should not be relied upon completely (also considering that they are use internationally during migration events), they should not be discounted and may well hold valuable application in South Africa.

If implemented correctly, the measures listed in the table above may result in fewer collisions and the probability of collisions reduces to possible, and the intensity reduces to Medium. The residual significance of wind turbine collisions *phase 2* will therefore be reduced to medium, although confidence in this assessment is moderate due to the lack of operational phase data (particularly in the central Karoo) and data on the interactions of local species with turbines as well as uncertainties with regarding the effectiveness of mitigation measures (including turbine placement outside of high risk areas), particularly for Verreaux's Eagle.

11.4.5 Updated Recommendations and Mitigation Measures

All applicable mitigation measures and recommendations (where they are not in contradiction to, or superseded by those given in this report) in the avifaunal impact assessment report (Pearson, 2015) must be adhered to. In summary these include:

- Ongoing monitoring of all Verreaux's Eagle nest sites prior to construction (to determine nest status), and through the construction and entire operational phase of the project.
- Pre-construction walk-through by the avifaunal specialist covering the final road, powerline and turbine layouts.
- The implementation of a site specific Construction Environmental Management Plan (CEMP).
- Prior approval by an avifaunal specialist before clearing of any alien vegetation or stands of trees.
- On-site and off-site habitat management. A habitat management plan must be developed which aims to prevent an influx/increase in preferred prey items (e.g. dassies) in the turbine area due to the construction and operation activities, while improving raptor habitat and promoting prey availability within the core 3 km buffers around nest sites (i.e. away from the turbine site).
- Implementation of a habitat restoration plan (which can be included in the above habitat management plan) to ensure rehabilitation of disturbed areas following construction.
- The appointed Environmental Control Officer (ECO) and the on-site WEF manager (during operations) must be trained by the avifaunal specialist to identify the potential priority species and make a concerted effort to look out for breeding activities of red data species. If any of the red data species are confirmed to be breeding (e.g. if a nest site is found), activities within 1 km of the breeding site must cease, and the avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed.
- Nest searches by an avifaunal specialist of all potentially suitable cliffs and/or tree nesting sites within 1 km of the Phase 1 turbine footprints that were not surveyed as part of the pre-construction cliff surveys. This additional survey must preferably be prior to construction commencement or as soon as possible thereafter. The aim will be

[30] http://www.bbc.com/news/uk-scotland-highlands-islands-42578354

to locate nest sites, so that these may continue to be monitored during the construction and operation phase, along with the monitoring of already identified nest sites.

- Appoint a specialist to design and conduct monitoring of eagle nest sites that are within 5 km of a turbine position. This should be done at least three times during a calendar year during construction and operation, optimally spaced before, during and after the breeding season.
- The implementation of a site specific Operational Environmental Management Plan (OEMP).
- No turbines should be placed in any Avifaunal No-go area.
- There should be preferential turbine placement in areas of Low Sensitivity.
- Develop and implement a carcass search programme at all turbines for birds during the first two years of operation as a minimum, in line with the South African monitoring guidelines.
- Develop and implement a two year post-construction bird activity monitoring program that mirrors the pre-construction monitoring surveys completed by Arcus and is in line with the South African post-construction monitoring guidelines. This program must include thorough and ongoing nest searches and nest monitoring. This program should be enhanced to include sampling during dusk and dawn.
- A GPS/Satellite tagging study should be implemented to monitor Verreaux's Eagle, and to establish the true ranges and how the birds respond to the presence of turbines. Birds from at least three of the eagle territories closest to proposed turbines should be tagged and monitored. This will help to contribute greatly towards our understanding of how this species interacts with wind energy developments and will assist in determining the true levels of impact on this species, in order to more accurately advise future WEF development in the Karoo, and South Africa as a whole.
- Frequent and regular review of operational phase monitoring data (activity, carcass and GPS/satellite tracking) and results by the bird specialist.
- If unacceptable impacts are observed (in the opinion of the bird specialist in consultation with BLSA/EWT and DEA), the specialist should provide updated and relevant mitigations to be implemented. The developer must make financial allowances for additional mitigation measures.
- The following, if deemed necessary by the specialist conducting operational monitoring, may need to be considered and suitable financial allowances should be made for using deterrent devices (e.g. visual and noise deterrents) or deterrent and/or shutdown systems e.g. DT Bird and Radar Assisted Shutdown on Demand (RASOD) e.g. BIRDTRACK.
- If unacceptable impacts persist following implementation of additional mitigation, problem turbines may need to be temporarily/permanently shut down or re-located.
- If unacceptable impacts persist following implementation of additional mitigation, offset programmes must be investigated for possible implementation by the Wind Farm operator, and may include land stewardship/land purchase and rehabilitation to enhance Verreaux's Eagle populations elsewhere and/or financial assistance towards bird conservation.
- Powerlines connecting turbines strings on the WEF site must be buried where possible.
- Any overhead power lines must be constructed near to existing lines where possible, and must be of a design that minimizes electrocution risk by using adequately insulated 'bird friendly' monopole structures, with clearances between live components of 2 m or greater.
- An avifaunal specialist must conduct a site walk through of all above ground power line routings (both on the WEF site and the Grid Connection) prior to construction to determine if, and where, bird flight diverters (BFDs) are required.
- Install bird flight diverters as per the instructions of the specialist following the site walkthrough, which may include the need for modified BFDs fitted with solar powered LED lights on certain spans.

- The proposed Phase 1 Grid Connection should be re-routed to avoid, by 2 km or more, the location of the Verreaux's Eagle nest located at (31°43'39.50"S; 23°40'44.07"E) by Smallie, 2014.
- Results from monitoring must be assessed collectively with data from surrounding projects, and be made publicly available.
- Operational results to advise phases/projects not yet constructed, and if unacceptable impacts (as agreed between the specialist in consultations with DEA, BLSA and the BARESG group) are observed, and can't be mitigated, further development on nearby sites must be re-considered and/or stopped.
- The implementation of a site specific Decommissioning Environmental Management Plan (DEMP).
- Prior to decommission, consult with the avifaunal specialist who will advise if any additional relevant and updated mitigations must be implemented during this phase

It is extremely important that the results and recommendations of this report are used to advise the design of an appropriate construction phase and operational phase monitoring programme in line with current guidelines (Jenkins *et al*., 2015), both of which must be implemented if the WEF site is to be developed. Should operational monitoring reveal high levels of mortality, the developer must be prepared to institute appropriate operational mitigations which may include curtailment and/or a shut-down on demand strategy, all of which must be advised by ongoing operational bird activity and mortality monitoring.

11.5 Bats

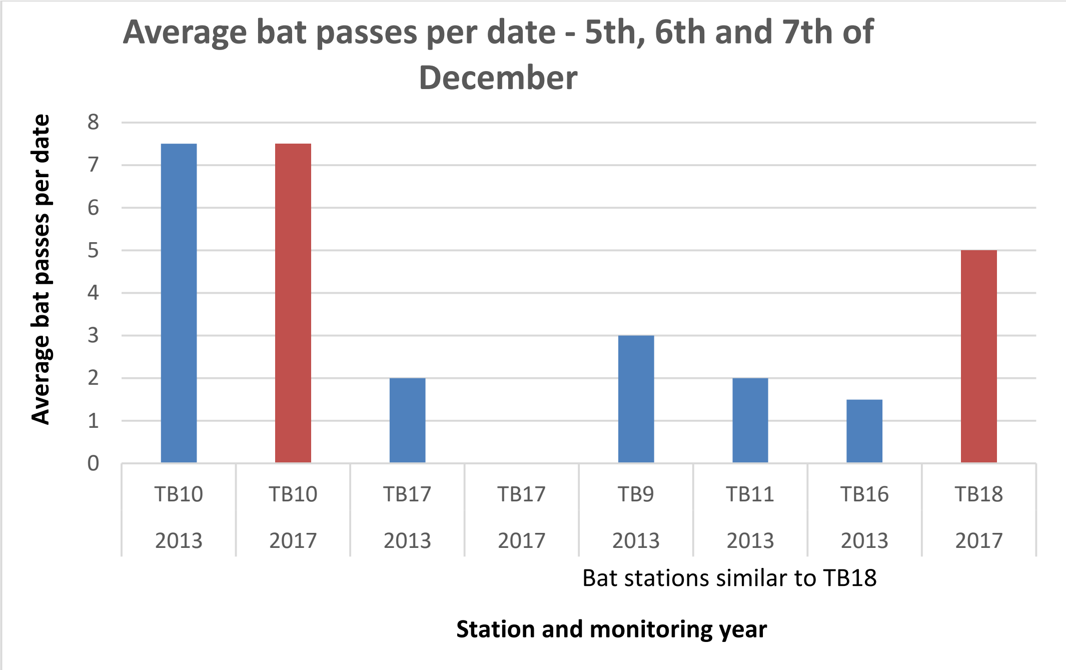
The original bat pre-construction monitoring on the site was conducted mid-July 2013 to mid-July 2014. As it has been more than three years since the monitoring was completed, according to Sowler et al. (2017), a specialists must provide an official statement in a letter on whether the original monitoring study is still valid.

The specialist must determine whether there is a need to conduct a desktop survey and/or a short field assessment in order to provide such a statement. From 5 to 7 December 2017, IWS conducted a field trip to assess the new turbine layout for Umsinde. To do this, IWS:

- Set up three Wildlife Acoustic SongMeter3 (SM3) bat detectors across the phases to record bat activity over two nights (5 and 6 December 2017). The detectors and microphones were set up on three existing meteorological masts at a height of 10 m.
- Assessed the general habitat and determined whether any significant environmental or climatic changes have occurred since the previous monitoring period and/or if any alterations to significant bat habitats had occurred in particular.
- Assessed the vegetation, topography and potential bat sensitivity of the area near and around the site of each proposed turbine. Many of the proposed turbine locations were difficult to access via existing road networks and given the limited time, IWS made the best attempt to get as close to each proposed location as possible and note the habitat, photograph it and assess the potential impacts for bats at each location.

11.5.1 Bat Activity

By averaging the bat passes per date in the month of December 2013 and for the two nights in December 2017, we roughly compared bat activity levels at monitoring stations relatively close to each other. The results are not very definitive –three different stations with three different results. At TB10, the results were similar in 2013 and 2017; at TB17 activity levels were higher in 2013 and at TB18 activity levels were higher in 2017. This could be because only two nights of December 2017 are being compared to a full month in December 2013. It could be because of the severe drought in 2017 and changes in the distribution of bats throughout the site.



Average Bat Activity Level Comparisons between 2013 and 2017

11.5.2 Updated Impact Assessment

Only impacts and mitigation measures that have been amended since IWS (2015) are raised here, otherwise all other impacts and mitigation measures from IWS (2015) remain as IWS's assessment and recommendations now. IWS notes that if the commitment is made in the EA that all mitigation recommendations described in the report are adhered to and adaptive management is applied based on SABAA's Threshold and Mitigation documents (to avoid cumulative impacts) then IWS does not object to the 70 turbine Umsinde project proceeding.

Roost disturbance and/or destruction due to wind turbine, O&M building, sub-station and road construction

Six confirmed and 14 potential bat roosts were located at Umsinde Emoyeni WEF by NSS (2014). The roost types that were identified included house roofs and tree roosts, rock overhangs in the gorges and small caves/ overhangs in the rocky outcrops. There seemed also to be a *Miniopterus natalensis* roost very close to mast TB 13, under a large inaccessible overhang in a deep gorge in the north west of the site. Other species of bat could also be roosting in the gorge.

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidenc*
Without mitigation	Regional 2	High 3	Short-term 1	**Medium** 6	Probable	**MEDIUM**	**– ve**	High
Essential mitigation measures: Turbine placement, sub-station and O&M buildings should only be built in areas of Low-Medium and Medium bat sensitivity. No part of any turbine, including the rotor swept zone should be constructed within areas of Medium-High or High bat sensitivity. Roads to only be built 500m from any confirmed roosts. Clearing of natural and agricultural areas be kept to a minimum. Blasting activities not to occur within 2km of any known bat roosts. Dust suppression measures to be used during the full construction phase. Any new roosts discovered, should be reported and incorporated into the adaptive management plan.								

Best practise mitigation measures: Roost searches to continue during construction and operational phases.								
With mitigation	Local 1	Medium 2	Short-term 1	**Very Low** **4**	Possible	**INSIGNIFICANT**	**– ve**	High

Disturbance to and displacement from foraging habitat due to wind turbine, O&M building sub-station and road construction

Construction will involve vegetation clearance at the footprint of each turbine, hard stand area, along the road network, at the office and sub-station buildings. This causes disturbance to bat foraging habitat. General dust and noise will increase in the area which may cause more sensitive species to disperse either temporarily or permanently.

	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Regional 2	Medium 2	Medium-term 2	**Medium** 6	Definite	**MEDIUM**	**– ve**	High
Essential mitigation measures: Turbine bases, hard stand, office, sub-station and lay-down areas should only be in areas of Low-Medium and Medium bat sensitivity. With the exception of compulsory civil aviation lighting, minimise artificial lighting at night, especially high-intensity lighting, steady-burning, or bright lights such as sodium vapour, quartz, halogen, or other bright spotlights at sub-station, offices and turbines. All non-aviation lights should be hooded downward and directed to minimise horizontal and skyward illumination. Roads may cross areas of bat foraging habitat, but: Clearing of natural and agricultural areas be kept to a minimum. Dust control measures should in commissioned.								
With mitigation	Local 1	Medium 2	Medium-term 2	**Low** **5**	Definite	**LOW**	**– ve**	High

Fatalities of Medium-High and High risk bat species due to collision or barotrauma during foraging activity, attraction to turbines and during seasonal movements or migration events.

Bat deaths by collision with or due to barotrauma caused by wind turbines have been reported worldwide (Kunz *et al.*, 2007; Arnett *et al.*, 2008; Baerwald *et al.*, 2008; Rydell *et al.*, 2010; Baerwald and Barclay, 2011; Hull and Cawthen, 2013; Voigt *et al.*, 2012; Lehnert *et al.*, 2014), including for South Africa (SA) (Doty and Martin, 2012; MacEwan, 2016). There is not a single WEF in SA, where operational monitoring is being conducted, that has not had any bat fatalities (Perrold and MacEwan, 2017).

There are various hypotheses as to why certain species of bats are killed by wind turbines, but one common hypothesis that is emerging worldwide, is that bats that move and feed in less cluttered and more open-air space environments, are more vulnerable to collisions with wind turbines than those moving and feeding in more cluttered environments (Arnett, 2017).

Arnett and Baerwald (2013) did a comparison of bat fatality data from 123 studies at 72 operational WEFs from all over the United States of America (USA) and Canada for the period 2000 to 2011. The results varied substantially based on geographic locality and habitat type with the lowest mean fatalities being 1.39 bats/MW/year in Great Basin/Southwest Open Range-Desert to 8.03 bats/MW/year in Northeastern Deciduous Forest (with one study site yielding an outlying result of 41.17 bats/MW/year in the Southeastern Mixed Forest).

Perrold and MacEwan (2017) did a comparison of bat fatality data from across 10 Year 1 studies at 10 operational WEFs from the Eastern, Northern and Western Cape Provinces of South Africa (SA). The results varied based on geographic locality and habitat type with the lowest mean fatalities at a site in the Drakensberg Montane Grasslands, Woodlands and Forests ecoregion being 0.91 bats/MW/year to 7.38 bats/MW/year at a site in the Nama Karoo ecoregion (with one study site yielding an outlying results of 16.8 bats/MW/year in the Lowland Fynbos ecoregion).

The majority of the Umsinde Phase 2 turbine layout occur within the Nama Karoo ecoregion, hence, based on Perrold and MacEwan (2017) the risk of fatality is potentially high. However, if purely based on the average hourly bat activity levels in 2013 at Umsinde (NSS, 2014), the risk of fatality is low-medium according to Table 5 of Sowler *et al.* (2017).

Additionally, migrating bats in the USA and Europe have been shown to be at risk of fatality due to wind turbines. Whilst the migrating bats in South Africa are different species and are not tree-roosting species, the long distances that they travel and the height at which they fly also puts them at risk of fatality. SA migrating bats are cave-dwellers and also fly very long-distances (>100km). *Miniopterus natalensis* that has been confirmed at Umsinde and most likely roosts within the study boundary area is one of these migrating species. These impacts could have far reaching consequences, not only locally, but regionally too. Isotope studies in Europe have revealed that wind farms may kill bats from populations more than 1,000km away (Voigt et al. 2012). Fatality of bats from potentially large geographic areas could have a devastating, long-term impact on species.

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	National 3	High 3	Long-term 3	**Very High** 9	Probable	**VERY HIGH**	**– ve**	High

Essential mitigation measures:

Turbine placement should only be in areas of Low-Medium and Medium bat sensitivity. No part of any turbine, including the full rotor swept zone should be constructed within areas of Medium-High or High bat sensitivity.

With the exception of compulsory civil aviation lighting, minimise artificial lighting at night, especially high-intensity lighting, steady-burning, or bright lights such as sodium vapour, quartz, halogen, or other bright spotlights at sub-station, offices and turbines. All non-aviation lights should be hooded downward and directed to minimise horizontal and skyward illumination.

No turbines to be placed within 200 m of the O&M buildings or sub-stations.

Turbine engineers work with bat specialists to build in the necessary turbine adaptions needed for erecting bat detectors or deterrent devices on the turbines in the design phase, so there are no unexpected surprises or concerns after the turbines are built.

For areas of Low-Medium and Medium Sensitivity

With the exception of when temperatures are below 12°C:

An initial cut-in speed of 5.25 m/s (approximately 50% of bat activity occurs below this wind speed) is recommended as follows:

Not in winter, i.e. the months of June, July and August.

20h00 to 04h00 in Summer

18h30 to 04h30 in Autumn

19h00 to 04h00 in Spring

Operational monitoring according to Aronson *et al.* (2014) or any more recent revisions to this document, reporting and adaptive management will be key to keeping the residual impact of the facility as low as possible.

The SABAA Threshold document (MacEwan *et al.* 2017 or later versions) should be used in the adaptive management decision making process.

Construction phase monitoring on at least one met mast in each phase commences as soon as Phase 1 construction of any sort starts. Any additional mitigation measures that arise from the monitoring and from lessons learned from Phase 1 operational monitoring, get implemented in Phase 2.

Best practise mitigation measures:

All live and fatality monitoring data should be fed into the SANBI database to assist with enhancing the scientific knowledge base for information decision making and mitigation recommendations.

During operational monitoring, quarterly progress reports and annual monitoring reports to be submitted to SABAAP, EWT and the DEA.

Monthly carcass searching reports to be submitted to the SABAAP.

As new information becomes available with regard to successful mitigation strategies tested, this information should feed into the adaptive management plan.								
With mitigation	Regional 2	Low 1	Long-term 3	Medium 6	**Possible**	**LOW**	**– ve**	**High**

11.6 Social

The approach to preparing the Addendum Report involved:

- Review of revised layouts;
- Review of key findings of SIA undertaken in 2015 (Barbour, December 2015);
- Site visit to study area and meetings with affected landowners and stakeholders (January 21-24 2017). Annexure A (of the Social Addendum Report - Volume III) contains a list of the affected landowners and stakeholders interviewed;
- Preparation of Addendum Report.

Note: Mr Andre van der Spuy (a registered I&AP) was contacted and informed of the preparation of an Addendum Report. Mr van der Spuy indicated that it would not be necessary to meet. Mr Izak van der Merwe, who is represented by Mr van der Spuy, was also contacted. On the advice of Mr van der Spuy, the meeting with Mr Izak van der Merwe was not recorded as formal meeting and as such is not listed in Annexure A of the Addedum Letter of the Social Impact Assessment (Volum III – Specialist Reports, Part I and Part II).

The number of proposed wind turbines was initially reduced from 98 (original proposal) to 55 per phase (Revised Layout 1: Phase 1 and 2). Revised Layout 1 was subsequently reduced to 35 turbines per phase (Revised Layout 2: Phase 1 and 2). While the number of turbines has been reduced the envisaged output will remain unchanged, namely 140 MW. This will be achieved by establishing higher-capacity wind turbines.

Revised Layout 2 was developed after the site visit undertaken by Schalk van der Merwe (21-24 January 2018). The observations and interviews during the site visit were based on the layout associated with Revised Layout 1 (55 wind turbines per phase). A summary of the key findings from the site visit is contained Annexure A (Addedum Letter of the Social Impact Assessment (Volum III – Specialist Reports, Part I and Part II).

A brief comment on the differences between Revised Layout 1 and 2 (Phase 2) is provided below.

Phase 1: Revised Layout 1 vs 2

The number of turbines has been decreased from 55 (Revised Layout 1) to 35 (Revised Layout 2), a reduction of 20 wind turbines. The development area remains essentially the same. The outer limit of the development area has only increased with regard to one turbine, and only by ~400 m (Revision 2, turbine 8). In more instances the outer limited has shrunken a few hundred meters due to turbines associated with Revised Layout 1 being removed. In most instances however, the outermost locations have remained identical. Proposed site access remains unchanged.

The land owners who would potentially be directly affected by Revised Layout 2 remain the same as those affected by Revised Layout 1. The same local receptors such as farmsteads and local roads would remain affected and over similar distances. However, the number of turbine density has decreased. This is likely to reduce the potential visual impact on the areas sense of impacts. The key findings and assessment of issues based on Revised Layout 1 remain unchanged (See Annexure A - Addendum Letter of the Social Impact Assessment (Volume III – Specialist Reports, Part I and Part II).

The key findings of the December 2015 SIA (Barbour, 2015) were summarised under the following sections:

- Fit with policy and planning;
- Construction phase impacts;
- Operational phase impacts;
- Cumulative Impacts;
- Decommissioning phase impacts;
- No-development option.

Comment on the relevance of the findings in terms of Revised Layout 2 for Phase 1 are provided below.

11.6.1 Fit with policy and planning

The findings of the review of the relevant policies and documents pertaining to the energy sector indicated that the renewable energy was supported at a national and provincial level. However, the provincial and local policy and planning documents also make reference to the importance of tourism and the region's natural resources. Care therefore needs to be taken to ensure that the development of large renewable energy projects, such as the proposed facility, does not impact on the region's natural resources and the tourism potential of the Province.

This finding remains valid for Revised Layout 2 (35 turbines) for Phase 2.

11.6.2 Construction phase impacts

The key social issues associated with the construction phase include:

<u>Potential positive impacts</u>

- Creation of employment and business opportunities, and the opportunity for skills development and on-site training;
- Benefits associated with providing technical advice on wind energy to local farmers and municipalities;
- Improved cell phone reception.

<u>Potential negative impacts</u>

- Impacts associated with the presence of construction workers on site and in the area;
- Influx of job seekers to the area;
- Increased safety risk to farmers, risk of stock theft and damage to farm infrastructure associated with presence of construction workers on the site;
- Increased risk of veld fires;
- Impact of heavy vehicles, including damage to roads, safety and dust;
- Potential loss of productive farmland associated with construction-related activities.

The findings of the SIA (Barbour, December 2015) indicated that the significance rating for all of the potential negative impacts with mitigation was Low Negative. All of the potential negative impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented. However, in order to effectively mitigate the impact of construction workers on the local community of Murraysburg will require the implementation of an effective training and skills development programme prior to the implementation of the construction phase aimed at maximising the employment opportunities for local residents during the construction phase. In the absence of such a programme the impact of construction workers on the local community of Murraysburg was assessed to be Medium Negative.

The table below summarizes the findings of the 2015 SIA assessment of impacts associated with the Construction Phase.

Summary of social impacts during the construction phase

Impact	Significance No Mitigation	Significance With Mitigation/Enhancement
Creation of employment and business opportunities	Low (Positive)	High (Positive)
Benefits associated with providing technical advice to local farmers and municipalities	N/A	Low (Positive)
Improved cell-phone coverage	Low (Positive)	Low (Positive)
Presence of construction workers and potential impacts on family structures and social networks	Medium (Negative for community as a whole)	Low (Negative for community as a whole)
Influx of job seekers	Low (Negative)	Low (Negative)
Safety risk, stock theft and damage to farm infrastructure associated with presence of construction workers	Low (Negative impact)	Very-Low (Negative impact)
Increased risk of veld fires	Medium (Negative)	Low (Negative)
Impact of heavy vehicles and construction activities	Medium (Negative)	Low (Negative)
Loss of farmland	Low (Negative)	Very Low (Negative)

Comment on implication of Revised Layout 2 Phase 1 on significance ratings for Construction Phase

Revised Layout 2 of 35 turbines will result in the number of wind turbines associated with Phase 1 being reduced from 98 to 35, a reduction of 63 turbines (64%). This reduction will have implications for the potential impacts associated with the number of employment opportunities created and the risks posed by construction workers to local communities and social networks.

Due to the reduced number of employment opportunities, the significance will change from *High Positive* to *Medium Positive*. The reduced number of construction workers will potential reduce the pressure in finding accommodation in Murraysburg and also the potential risk to the local community. The overall significance with mitigation will however remain Low.

Despite the reduced number of employment opportunities the potential benefits for local communities is confirmed by the findings of the Overview of the Independent Power Producers Procurement Programme (IPPPP) undertaken by the Department of Energy, National Treasury and DBSA (30 September 2016). The study found that employment opportunities created during the construction phase of the projects implemented to date had created 61% more jobs than anticipated. The study also found that significantly more people from local communities were employed during construction than was initially planned. In this regard the expectation for local community participation was 6 771 job years. To date 15 215 job years have been realised (i.e. 125% greater than initially planned). Black South African citizens, youths and rural or local communities have been the major beneficiaries during the construction phases, as they respectively represent 80%, 41% and 52% of total job opportunities created by IPPs to date.

The remainder of the significance ratings for Revised Layout 2 of 35 turbines for Phase 1 remain valid. All of the potential negative social impacts can therefore be effectively mitigated if the recommended mitigation measures are implemented.

11.6.3 Operational phase impacts

The key social issues affecting the operational phase include:

<u>Potential positive impacts</u>

- Creation of employment and business opportunities. The operational phase will also create opportunities for skills development and training;
- Benefits associated with the establishment of a Community Trust;
- The establishment of infrastructure to generate renewable energy.

The 2016 IPPP Overview (30 September 2016) notes that to date (across 6 bid windows) a total contribution of R19.3 billion has been committed to Socio-economic Development (SED) initiatives linked to Community Trusts. Of this total commitment, R15.2 billion has been specifically allocated to local communities where the IPPs operate. The Green Jobs study (2011), found that the case for wind power is enhanced by the positive effect on rural or regional development. In this regard wind farms located in rural areas create an opportunity to benefit the local and regional economy through the creation of jobs and tax revenues. The findings of a thesis by Tait (2012) indicated that the distributed nature of renewable energy generation can induce a more geographically dispersed pattern of development. As a result renewable energy sites can be highly suited to rural locations with otherwise poor potential to attract local inward investment thus able to target particularly vulnerable areas. In her conclusion Tait notes that thesis found positive evidence for the establishment of community benefit schemes in the wind sector in South Africa.

<u>Potential negative impacts</u>

- The visual impacts and associated impact on sense of place;
- Potential impact on tourism.

The findings of the SIA indicated that the key affected property in terms of potential visual impacts is Badsfontein Farm owned by Mr Izak van der Merwe. In this regard Badsfontein is also impacted by the wind turbines associated with the Ishwati Emoyeni WEF to the north of the farm. *If the wind turbines associated with the Umsinde Emoyeni WEF are located in such a way as they are not visible from Badsfontein Farm the significance rating will be Low Negative. The visual specialist assessment concludes that phase 2 of the development will only be marginally visible from Badsfontein (gate, opstal, and dam).*

The table below summarises the significance of the impacts associated with the operational phase.

Summary of social impacts during operational phase

Impact	Significance No Mitigation	Significance With Mitigation/Enhancement
Creation of employment and business opportunities	Low (Positive)	Medium (Positive)
Establishment of Community Trust	Medium (Positive)	High (Positive)

Promotion of renewable energy projects	Medium (Positive)	Medium (Positive)
Visual impact and impact on sense of place	High (Negative)	Medium (Negative)
Impact on tourism	Medium	Low

Comment on implication of Revised Layout 2 (Phase 2) on significance ratings for Operational Phase

Revised Layout 2 will result in the number of wind turbines associated with Phase 1 being reduced from 98 to 35, a reduction of 63 turbines (64%) per phase. This reduction will have implications for the potential impacts associated with the number of employment opportunities created. Due to the reduced number of employment opportunities, the significance will change from Medium to Low Positive.

The remainder of the significance ratings for Revised Layout 2 for Phase 2 remain valid. *It should however be noted that none of the affected property owners interviewed indicated that they were concerned about the potential visual impacts associated with the wind turbines.*

Comment on potential impact on property values

The potential impact of the proposed WEF on property values was raised as a concern during the site visit in January 2018. A literature review was undertaken by the author as part of an SIA for a WEF in 2017. It should be noted that the review does not constitute a property evaluation study and merely seeks to 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 namely:

- Stephen Gibbons (April, 2014): Gone with the wind: Valuing the Visual Impacts of Wind turbines through house prices. London School of Economics and Political Sciences & Spatial Economics Research Centre, SERC Discussion Paper 159;
- Review of the Impact of Wind Farms on Property Values, Urbis Pty Ltd (2016): Commissioned by the Office of Environment and Heritage, NSW, Australia;
- Yasin Sunak and Reinhard Madlener (May 2012): The Impact of Wind Farms on Property Values: A Geographically Weighted Hedonic Pricing. School of Business and Economics / E.ON Energy Research Center, RWTH Aachen University. Model Working Paper No. 3/2012;
- Martin D. Heintzelman and Carrie M. Tuttle (March 3, 2011): Values in the Wind: A Hedonic Analysis of Wind Power Facilities. Economics and Financial Studies School of Business, Clarkson University;
- Ben Hoen, Jason P. Brown, Thomas Jackson, Ryan Wiser, Mark Thayer and Peter Cappers (August 2013): A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States. Ernest Orlando Lawrence Berkeley National Laboratory.

The literature reviewed was based on an attempt by the author to identify what appear to be "academically and or scientifically" based studies that have been undertaken by reputable institutions post 2010. The most comprehensive study appears to the study by Gibbons (2014), which found that "averaging over wind farms of all sizes" the price reduction was around 5-6% within 2km, falling to less than 2% between 2 and 4km, and less than 1% by 14km which is at the limit of likely visibility. While the focus of the Gibbons study was on residential properties it does indicate that the larger the distance the less the impact. The findings of the Urbis (2016) study indicate that "wind farms may not significantly impact rural properties used for agricultural purposes".

Based on the outcome of the Urbis study (2016) the authors were of the opinion that wind farms may not significantly impact rural properties used for agricultural purposes. In conclusion, the authors of the Urbis study found that 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.

Based on the findings of the literature review the potential impact of the proposed Umsinde Phase 1 WEF Revised Layout 2 on the property values in the area is likely to be low.

Comment on potential impact on tourism

The potential impact of the proposed WEF on future eco-tourism facilities was raised as a concern during the site visit in January 2018. A review of international literature in the impact of wind farms on tourism was undertaken as part of an SIA for another WEF in 2017. 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

The research by Aitchison (2012) found that that previous research from other areas of the UK has demonstrated that wind farms are very unlikely to have any adverse impact on tourist numbers (volume), tourist expenditure (value) or tourism experience (satisfaction) (Glasgow Caledonian University, 2008; University of the West of England, 2004). In addition, to date, there is no evidence to demonstrate that any wind farm development in the UK or overseas has resulted in any adverse impact on tourism. In conclusion, the findings from both primary and secondary research relating to the actual and potential tourism impact of wind farms indicate that there will be neither an overall decline in the number of tourists visiting an area nor any overall financial loss in tourism-related earnings as a result of a wind farm development.

In addition, all of the studies that have sought to predict impact have demonstrated that any negative impact of wind farms on tourism will be more than outweighed by the increase in tourists that are attracted by wind farms, by the increase in employment brought about by the development of wind farms and/or by the continuing growth of tourism. The study by the Glasgow Caledonian University (2008) found that only a negligible fraction of tourists will change their decision whether to return to Scotland as a whole because they have seen a wind farm during their visit. The study also found that 51.0% of respondents indicated that they thought wind farms could be tourist attractions. In this regard the visitor centre at the Whitelee Wind Farm in east Ayrshire Scotland run by ScottishPower Renewables has become one of the most popular 'eco-attractions' in Scotland, receiving 200 000 visitors since it opened in 2009.

The study by Regeneris Consulting (2014) found that there was no evidence that wind farms would deter tourists from traveling along designated visitor or tourists routes. The study indicated that small minorities of visitors would be encouraged, whilst others would be discouraged. Overall, however, there was no evidence to suggest that there would be any significant change in visitor numbers using these routes to reach destination elsewhere. The study also found that in more sensitive locations the potential negative effect on visitor numbers may still be low overall, but in some circumstances could be moderate. The greatest concern exists amongst areas and businesses closest to wind farms and appealing to visitor markets most sensitive to changes in landscape quality.

Based on the findings of the literature review there is limited evidence to suggest that the proposed Umsinde Phase 1 WEF Revised Layout 2 would have a significant impact on the tourism in the area. The findings of the review also indicate that wind farms do not impact on tourist routes.

11.6.4 Key Findings and Conclusions

The findings of the SIA (Barbour December 2015) indicated that the development of the proposed Umsinde Emoyeni WEF Phase 2 would create employment and business opportunities for the local economy, specifically during the construction phase. However, for the community of Murraysburg and other local towns in the area to benefit from these opportunities will require the implementation of an effective training and skills development programme prior to the commencement of the construction phase and a commitment from the proponent to achieve local employment targets for low and semi-skilled jobs. The establishment of a Community Trust would also benefit the local community. Local community shareholding in the project is a requirement of the REIPPPP and this often takes the form of a community trust, the exact machinations of how the community will be granted ownership will be decided once the project is bid. This would either take the form of a "free-carry" type arrangement whereby the community is granted shares or in the form of debt that would be repaid with dividends received. The proposed development also represented an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole.

The SIA also noted that the potential visual impacts associated with the proposed Umsinde Emoyeni WEF Phase 2 could be effectively addressed by ensuring that no wind turbines are visible from the Farm Badsfontein. In addition, the recommendations contained in the VIA should be implemented.

Based on these findings the SIA recommended that the Umsinde Emoyeni WEF Phase 1 be supported, subject to the implementation of the recommended mitigation measures and management actions contained in the SIA and VIA Report.

Revised Layout 2 for Phase 2 will result in the total number of wind turbines being reduced from 98 to 35. This represents a significant reduction. While the reduction in wind turbines will reduce the number of employment opportunities associated with the construction and operational phase, it will also reduce the visual and cumulative impacts of the proposed Umsinde Phase 1 WEF on the areas sense of place. This is regarded as an overall improvement.

The recommendations contained in the December 2015 SIA (Barbour, December 2015) therefore remain valid, namely that the establishment of the Umsinde Emoyeni WEF (Phase 2 Revised Layout 2) be supported, subject to the implementation of the recommended mitigation measures and management actions contained in the SIA (December 2015) and VIA Report.

11.7 Heritage and Palaeontology

The addendum report is entirely based on the 2015 observations of heritage sites in the area (palaeontology, archaeology, built environment and cultural landscape). No additional fieldwork has been included, as this was not deemed necessary, The project area remains the same and the previous survey that was completed in 2014 and released in 2015 remains largely applicable as the baseline observations obtained are relevant to the entire project area and do not expire, unless massive physical and environmental change has taken place which is not the case.

The method of recording and the kind of heritage assessed meets the current requirements of the National Heritage Resources Act, 25 of 1999.

11.7.1 Palaeontology

There are two kinds of rock in the study area. These are shales and mud-stones of the Beaufort Group which in this area are highly fossiliferous, and the high altitude dolerite ridges, sills and screes which are not. The positioning of the bulk of infrastructure in the high dolerite areas, as stated previously is of benefit in terms of palaeontology however impacts remain possible at any point where turbines and road cuttings will penetrate mudstones and shales. The Murraysburg area is one of the richest palaeontological zones in RSA.

Mitigation

As recommended in Almonds 2014 report, a palaeontologist must do a walk-down of any portion of the site that prior to construction to identify road cuttings and turbine foundations in shale and mudstone areas that will need to be monitored during construction (as per recommendations 2014). The placement of turbines on mainly dolerite areas has contributed to making this task less onerous.

11.7.2 *Archaeology*

Potential impacts to archaeological sites in terms of both turbine positions and access roads will remain the same as before, although confining the turbines to the windswept highlands may also be an advantage as these areas were more thinly populated in the past by humans.

There does; however remain the possibilities of impacts to prehistoric and historic rock engravings which occur in the area. Finding engravings on the dolerite boulders (which can occur as single outcrops or mazes) has to be done carefully on foot. These is no easy way to find them other than by checking every boulder outcrop, which in a project area of this size is a significant task. This heritage can be exceptionally ancient and can be very highly significant. The access road system will remain a possible source of impact as it will be necessary to displace boulders, or even break them to clear the way.

Mitigation

The recommendation in the 2014 Heritage Impact Assessment remains relevant in that it will be necessary for an archaeologist to check final road and turbine sites so that rock engravings can be identified, photographed and moved before they are damaged or destroyed.

11.7.3 *Colonial period heritage (built environment)*

It is noted that the placement of turbines, for phase 2 on the highest areas of the project area has reduced the impact, especially in the southern areas. It is here where the majority of historic structures are situated. This will go further in terms of minimising impacts to sense of place and context and as such is supported. Hence the impact tables for cultural landscape as well as built environment have been adjusted to accommodate this decreased impact.

Nature of impacts: Historic structures are sensitive to physical damage such as demolition as well as neglect. They are also context sensitive in that changes to the surrounding landscape will affect their significance.

Extent of Impacts: Direct impacts are not expected. Some visual impacts in terms of Karoo context are expected.

Significance of impacts: Given that there are no structures or historical sites that will be affected by Phase 2 of Umsinde Emoyeni physical impacts will be low, but impacts to context at some sites will be medium significance.

Status of impacts: Within the boundaries of the proposed wind energy facility, impacts are considered to be low negative.

Revised table for impacts to colonial period heritage.

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigation	**Local 1**	**Low 1**	**Long-term**	Medium 4	**Possible**	Medium	– ve	**High**
Essential mitigation measures: • **No essential mitigation measures are suggested.** Best practice mitigation measures • **Re-use and sensitive repair of abandoned farm houses would make a positive contribution to heritage conservation. Refurbishment should be done under the advice of a heritage architect/consultant.**								
With mitigation	**Local 1**	**Low 2**	**Long-term**	Medium 5	**Probable**	Medium	+ve	**High**

11.7.4 *Landscape and setting*

The renewed placement of turbines for phase 2 has assisted in further relieving the cultural landscape impacts associated with a number of historical farmsteads in the area. The infrastructure is confined to the more remote and inhospitable parts of the project area with the result that visual and contextual impacts to historic farmsteads are further reduced.

Nature of impacts: Cultural landscapes are highly sensitive to accumulative impacts and large scale development activities that change the character and public memory of a place. In terms of the National Heritage Resources Act, a cultural landscape may also include a natural landscape of high rarity value, aesthetic and scientific significance. The construction of a large facility can result in changes to the overall sense of place of a locality, if not a region. There will be high visibility of some turbines for a distance along local roads. A tangible change to sense of place will be experienced by farmer and road user however the impact will be reduced due to the lower number of turbines proposed. Major visual impacts to the R63 are avoided.

Extent of impacts: Wind Turbines are without doubt conspicuous structures which will affect the atmosphere of the "place". While this impact may be considered local in terms of physical extent, there may be wider implications in terms of the change in "identity" of the area and the accumulative effect this could have on future tourism potential. The impact of the proposed activity will be local.

Significance of impacts: The impact of the proposed activity is medium without mitigation.

Status of impacts: The status of the impact is negative.

Summary of impacts - landscape and setting.

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigatio	**Local 1**	**Mediu m**	**Long-term**	Medium 6	**Likely**	Medium	– ve	**Hig**
Essential mitigation measures: • **Mitigation very difficult to achieve, however recommendations of the VIA apply.**								
With mitigatio	**Loca l**	**Low 2**	**Long-term**	Medium 6	**Likely**	Medium	-ve	**Hig**

<u>Conclusion</u>

While the recommendations of Almond (2015) and Hart (2015) continue to be supported, indications are that the proponent has responded to the EIA of 2015 with the result that mitigation is less onerous and the proposed activity in its present form is acceptable.

11.8 Visual

The visual assessment for the previous layout was based on a number of quantitative and qualitative criteria to determine potential visual impacts, as well as their relative significance. The criteria are listed again below, and updated to reflect the new layout:

Visibility

Visibility is determined by distance between the energy facilities and the viewer. In some cases the distance has increased in the latest layout, mainly because there are fewer turbines, and therefore levels of visibility would be reduced. (See Table below).

- High visibility: Prominent feature within the observer's viewframe 0-2.5km
- Mod-high visibility: Relatively prominent within observer's viewframe 2.5-5km
- Moderate visibility: Only prominent with clear visibility as part of the wider landscape 5-15km
- Marginal visibility: Seen in very clear visibility as a minor element in the landscape 15-30km+

Potential Visibility

Viewpoint	Location	Coordinates	Distance	Phase	Visibility
VP5	Rhenosterfontein	31.7482S, 24.0921E	8.87km	2	Moderate
VP6	Avontuur	31.6701S, 24.0614E	16.27km	2	Not Visible
VP7	Philipskraal	31.7712S, 24.0484E	5.54km	2	High
VP9	Badsfontein gate	31.8016S, 23.7373E	15.27km	2	Marginal
VP10	Badsfontein opstal	31.7935S, 23.7433E	14.84km	2	Marginal
VP11	Badsfontein dam	31.7949S, 23.7455E	14.60km	2	Marginal
VP12	Elandspoort	31.6164S, 23.7734E	23.19km	2	Not Visible
VP13	Ratelfontein ridge	31.6162S, 23.6745E	29.32km	2	Not Visible
VP14	Ratelfontein east	31.6269S, 23.6833E	27.92km	2	Marginal
VP15	Ratelfontein saddle	31.6262S, 23.6769E	28.43km	2	Marginal
VP16	Rooisandheuwel	31.6885S, 23.7959E	15.51km	2	Marginal
VP17	Snyderskraal	31.8500S, 23.7432E	15.06km	2	Marginal
VP18	Brookfield	31.8882S, 23.7233E	18.27km	2	Marginal
VP19	Murraysburg town	31.9627S, 23.7711E	20.08km	2	Not Visible
VP20	Brandkraal	31.9638S, 23.7406E	22.01km	2	Not Visible

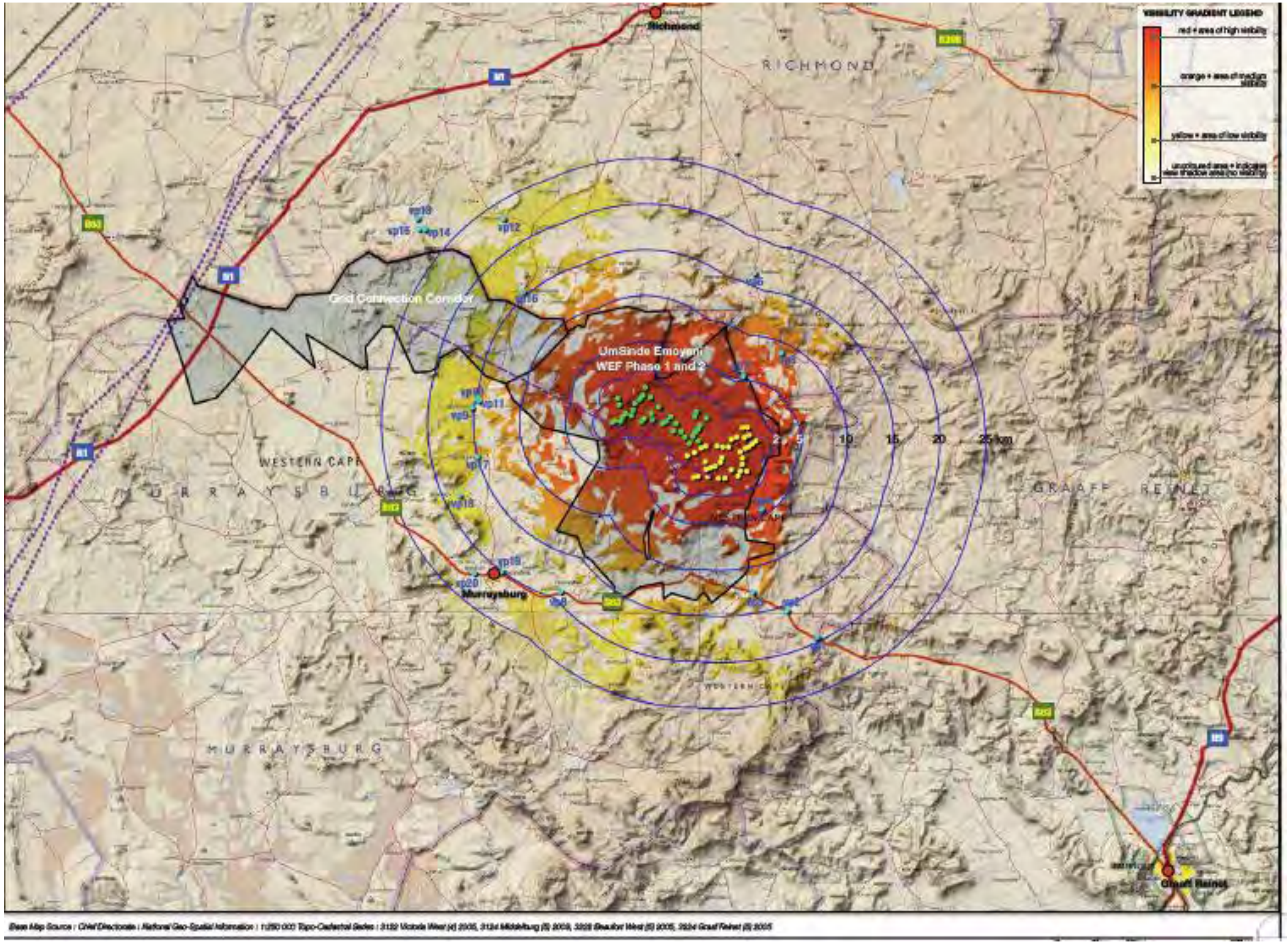


Figure 11.5 Viewshed Analysis

Visual Exposure

Viewsheds are compared for both the previous and the current WEF proposals. The viewshed for the current WEF proposed layout is marginally reduced from that of the previous proposal because of the fewer number of turbines.

Landscape Integrity

Visual quality is enhanced by the scenic or rural quality and intactness of the landscape, as well as lack of other visual intrusions. The Karoo landscape of the study area is at present generally intact with few visual intrusions. Both the previous and current WEF proposals have potential significance in terms of altering the rural landscape.

Cultural Landscape

Besides natural attributes, landscapes have a cultural value, enhanced by the presence of palaeontological and archaeological sites, historical settlements, farmsteads and cultivated lands. The mapping of these would be further informed by the heritage specialist study.

Visual Absorption Capacity

Ridges and koppies tend to have a screening effect at the broader scale, but the study area is otherwise relatively open and visually exposed in terms of the immediate surroundings, and therefore locally has a relatively low visual absorption capacity.

11.8.1 Updated Impact Assessment

The criteria above are considered in combination to determine the potential visual impact 'intensity' for both the previous and the current proposed layouts.

Comparison of Intensity of Potential Visual Impacts (Phase 2)

Criteria	Comments	Prev. turbine layout	Current turbine layout	Prev. power-line	Current power-line	Prev. construc-tion	Current construc-tion
Visibility of facilities Distance from selected viewpoints (Table 3)	Viewing distances further for the current proposals reducing the visibility of the turbines in some cases.	Very high (5)	High (4)	Medium (3)	Medium (3)	Very high (5)	High (4)
Visual exposure Zone of visual influence	Visual exposure marginally less for the current proposal, covering a slightly smaller geographic area.	High (4)	High (4)	Medium (3)	Medium (3)	High (4)	High (4)
Visual sensitivity Effect on landscape features	Visual sensitivity of landscape is similar for both previous and the current layouts.	High (4)	Medium (3)	Medium (3)	Medium (3)	High (4)	Medium (3)
Landscape integrity Effect on rural/ natural character of the area	Effect on landscape integrity would be similar for both previous and current layouts.	Very high (5)	Very high (5)	Medium (3)	Medium (3)	Very high (5)	Very high (5)
Visual absorption capacity (VAC)	VAC is similar for both proposals.	Medium (3)	Medium (3)	Medium (3)	Medium (3)	Medium (3)	Medium (3)
Overall visual impact intensity	Combination of the characteristics above.	Very high (21)	High (19)	Medium (15)	Medium (15)	Very high (21)	High (19)

Rating values: Very low (1), Low (2), Medium (3), High (4), and Very high (5).
Overall values: Very low (1-5), Low (6-10), Medium (11-15), High (15-20), Very high (21+)

Visual Impacts (Phase 2): Wind turbines

Rating	Definition of Rating	Previous	Current
A. *Extent– the area over which the impact will be experienced*			
Local	Confined to study area (approx. 30km radius)	1	1
B. *Intensity– the magnitude of the impact in relation to the sensitivity of the receiving environment, taking into account the degree to which the impact may cause irreplaceable loss of resources*			
High	Visual or scenic characteristics of the area are severely altered	3	3
C. *Duration– the timeframe over which the impact will be experienced and its reversibility*			
Long-term	More than 15 years. (Impact could be reversed at decommissioning stage)	3	3
Consequence	A+B+C (7)	High	High
Probability	Likelihood of the impact occurring (>90%)	Definite	Definite
Significance	High consequence + Definite	HIGH	HIGH
Status	Negative or positive	-ve	-ve
Confidence	Based on photomontages	High	High

Visual Impacts (Phase 2): Powerlines / Infrastructure

Rating	Definition of Rating	Previous	Current
A. *Extent– the area over which the impact will be experienced*			
Local	Confined to study area (approx. 20km radius)	1	1
B. *Intensity– the magnitude of the impact in relation to the sensitivity of the receiving environment, taking into account the degree to which the impact may cause irreplaceable loss of resources*			
Medium	Visual or scenic characteristics of the area are moderately altered	2	2
C. *Duration– the timeframe over which the impact will be experienced and its reversibility*			
Long-term	More than 15 years. (Impact could be reversed at decommissioning stage)	3	3
Consequence	A+B+C (6)	Medium	Medium
Probability	Likelihood of the impact occurring (>90%)	Definite	Definite
Significance	High consequence + Definite	MEDIUM	MEDIUM
Status	Negative or positive	-ve	-ve
Confidence	Based on photomontages	High	High

Visual Impacts (Phase 2): Construction Phase of WEF

Rating	Definition of Rating	Previous	Current
A. *Extent– the area over which the impact will be experienced*			
Local	Confined to study area (approx. 30km radius)	1	1
B. *Intensity– the magnitude of the impact in relation to the sensitivity of the receiving environment, taking into account the degree to which the impact may cause irreplaceable loss of resources*			
High	Visual or scenic characteristics of the area are severely altered	3	3
C. *Duration– the timeframe over which the impact will be experienced and its reversibility*			
Short-term	Less than 2 years.	1	1
Consequence	A+B+C (5)	Low	Low
Probability	Likelihood of the impact occurring (70-90%)	Probable	Probable
Significance	Low consequence + Probable	LOW	LOW
Status	Negative or positive	-ve	-ve
Confidence	Based on photomontages	Medium	Medium

Visual Impacts with mitigations (Phase 2): Wind turbines

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Previous without mitigation	Local 1	Very high 3	Long-term 3	High 7	Definite	HIGH	– ve	High
Current without mitigation	Local 1	High 3	Long-term 3	High 7	Definite	HIGH	– ve	High
Essential mitigation measures: (See Fig. 13). a) Visually sensitive peaks, major ridgelines and scarp edges, including 500m buffers, to be avoided, because of silhouette effect on the skyline. Peaks marked in yellow are important topographic features to be avoided in particular. b) Slopes steeper than 1:5 gradient to be avoided. c) Cultural landscapes or valuable cultivated land, particularly along alluvial river terraces to be avoided. d) Stream features, including 250m buffers, to be avoided. e) Buffers around settlements, farmsteads and roads to be observed.								
Previous with mitigation	Local 1	Medium 2	Long-term 3	Medium 6	probable	MEDIUM	– ve	Medium
Current with mitigation	Local 1	Medium 2	Long-term 3	Medium 6	probable	MEDIUM	– ve	Medium

Visual Impacts with mitigations (Phase 2): Construction

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Previous without mitigation	Local 1	Very high 3	Short-term 1	Low 5	Probable	LOW	– ve	Medium
Current without mitigation	Local 1	High 3	Short-term 1	Low 5	Probable	LOW	– ve	Medium
Essential mitigation measures: a) Access and haul roads to use existing farm tracks as far as possible. b) Construction camp, stockpiles and lay-down area to be located out of sight of district roads, possibly in the vicinity of the proposed substation and O&M buildings. c) Disturbed areas rather than pristine or intact land to preferably be used for the construction camp. Construction camp and laydown areas to be limited in area to only that which is essential. d) Measures to control wastes and litter to be included in the contract specification documents. e) Provision to be made for rehabilitation/ re-vegetation of areas damaged by construction activities.								
Previous with mitigation	Local 1	High 3	Short-term 1	Low 5	probable	LOW	– ve	Medium
Current with mitigation	Local 1	High 3	Short-term 1	Low 5	probable	LOW	– ve	Medium

The visual impact significance of Phase 2 would be high in intensity because of the location of the wind turbines, and because the proposed WEF would be visible from a range of viewpoints as can be seen in the photomontages. The significance has been reduced from high to medium through similar mitigations to those in Phase 1, including the elimination of many of the previously proposed turbines and through micro-siting.

In summary, there are now significantly fewer turbines (35) in phase 2 than in the previous WEF proposal of 2015, the turbines have been moved further north, away from the Trouberg and sensitive receptors, distances from sensitive receptors have increased in many cases, and the viewshed is slightly less extensive, particularly towards the south. In addition, the fewer turbines would potentially result in slightly less visual clutter on the skyline, as well as fewer access roads and assembly platforms being required.

Therefore, the current layout is preferred for the reasons given above. It follows that the cumulative visual impact would also be slightly less for the current WEF proposals than for the previous 2015 proposals. Any approvals should be subject to the recommended visual mitigations.

11.9 Noise

The original noise assessment concluded that the wind turbines were further than 1,000m from the closest potential noise-sensitive receptors, with the closest wind turbines around 1,000m. The impact assessment determined the potential noise impact to be of a very low significance. With the revised layout of 35 turbines, the closes turbines are located 1,250 m from the closest potential noise sensitive receptors, further than the previos layout. The change in the layout willnot increase the significance of the noise impact. The recommendations contained on the original noise impact assessment report (2015) remain valid.

11.10 Updated Environmental Sensitivity

Figure 9.10 shows the new layout of the development (35 turbines) taking into consideration the mitigation measures, buffers and sensitivity areas proposed by specialists during the updated impact assessment. This layout (figure 9.10) is what is to be approved by the DEA.

11.10.1 Bats

During the December 2017 site visit, IWS conducted a ground-truthing exercise across most of the newly proposed turbine positions. Based on IWS's extensive experience since 2013 at 9 operational WEFs in SA and based on the ground-truthing exercise, IWS revised the bat sensitivity map for Umsinde.

Updated Bat Sensitivity Map Classification

Sensitivity Class	Description
Low to Medium	The Low-Medium Sensitivity Areas were: • The remaining areas above the 1440 m, after the identified higher sensitivity classes were delineated. • All areas otherwise not designated with a higher sensitivity Most of these areas are higher lying plateau areas. The reason this is area is classified as Low to Medium, as opposed to just Low is that no one can be certain that the risk of bat fatality is low. Experience from the USA shows that whilst high activity does normally equate to high fatality, low activity does not necessarily equate to low fatality (pers comm. Cris Hein, 28 August 2014). Additionally, IWS is monitoring at 9 operational WEFs and all have had bat fatalities to a greater or lesser extent. IWS believes that the bats occurring in the lower valley areas for most of the year and in the harsher weather conditions will move and forage along the higher lying plateaus in optimal low wind speed and warm conditions.
Medium	The Medium Sensitivity Areas were:

	• All potential bat roosts with a 500 m buffer, • Ephemeral streams and dams ground-truthed in December 2017 as Medium, • Rocky gullies ground-truthed in December 2017 as Medium, plus a 50 m buffer, and • All areas otherwise not designated with a higher sensitivity below the 1440m contour.
Medium to High	The Medium - High Sensitivity Areas were made up as follows: The Upper Karoo Hardeveld vegetation type.
High	The High Sensitivity Areas were made up as follows: All FEPA wetlands & rivers with a 500m buffer. Confirmed bat roosts with 1 km Ephemeral streams and dams ground-truthed in December 2017 as High

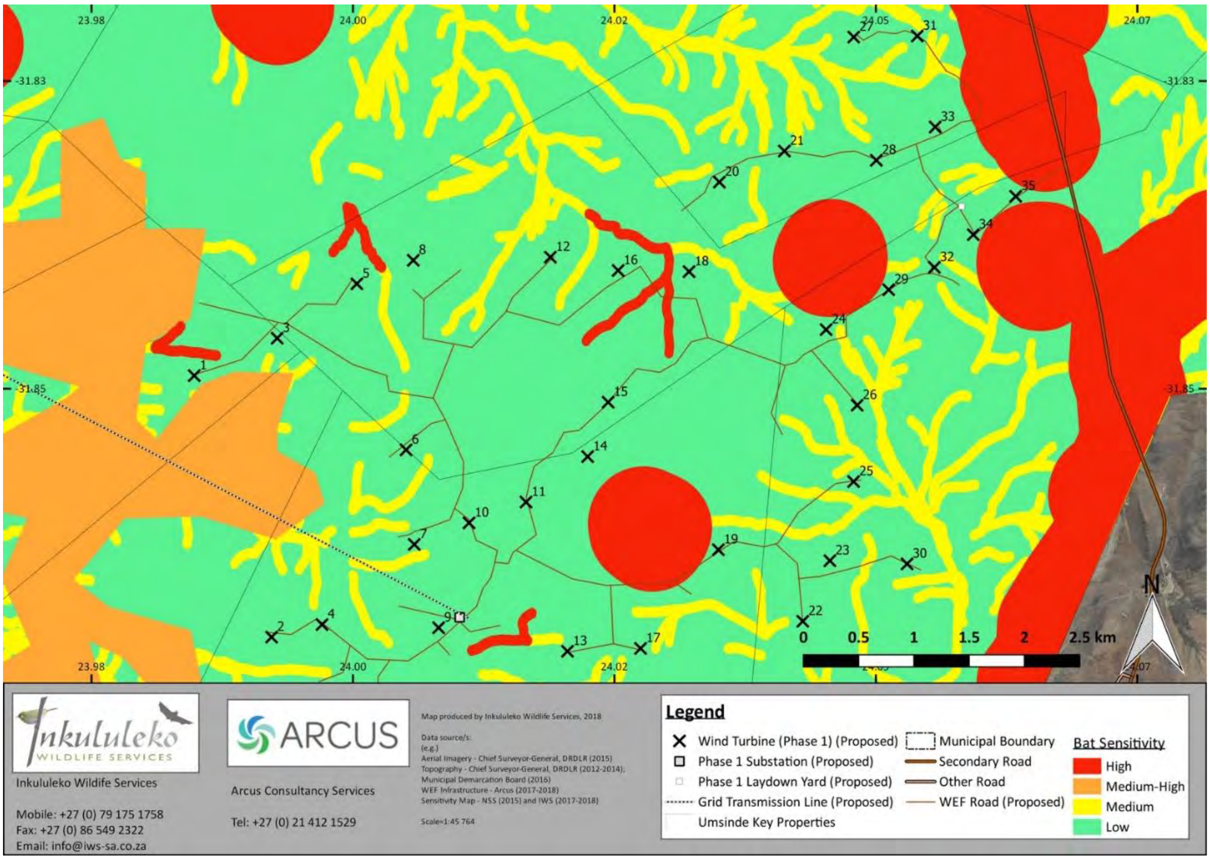


Figure 11.6 Umsinde 2017 Bat Sensitivity Map – Phase 1 Zoomed In

It must be noted that the site is currently in an area experiencing a drought and there was substantially less surface water than when IWS was last at the site. Additionally, one farmer mentioned that this was the driest he had seen the area since 1991/1992. From a bat perspective, this means that many areas in the drought may appear less sensitive considering the lack of water and the fact that surface water provides important foraging and drinking points for bats. IWS took this into account and assessed possible sensitivity based on presence of water during normal climatic conditions.

Based on the revised sensitivity map, no turbines are within or are <75 m from a High or Medium-High bat sensitive area. This should remain that no part of the turbine, including the full rotor sweep should encroach into the High or Medium-High bat sensitive areas.

Furthermore, whilst certain turbines have their base in a specific bat sensitive area, the blades encroach (based on a 75 m blade length) on a higher level of sensitivity. The turbines shown the table below are such turbines, *however, the turbines are not required to be moved but rather the mitigation measures applicable to Medium sensitive areas should be applied.*

Turbines which are within 75 m (rotor blade length) of a Medium bat sensitive areas according to the 2017 sensitivity map

Phase 2	• T10 is in a Medium bat sensitive area • T31 is 64 m from a Medium bat sensitive area

11.10.2 Birds

Avifaunal No-Go Areas (Figure 9.6) were identified through consideration of Pearson (2015) including the results of the initial monitoring, as well as the results of the 2016/17 monitoring programme, as follows:

- National Freshwater Ecosystem Priority Areas (NFEPA) rivers and wetlands buffers: 200 m
- Cultivated lands buffer: 200 m
- Ridge buffer: 150 m
- Additional (i.e. identified on site during nest survey work) rocky ridge habitat buffer: 300 m
- European Bee-eater colony buffer: 500 m
- Nest/Roost Site buffers:
  - Verreaux's Eagle nest sites (active and inactive): 3 000 m
  - Martial Eagle nest site (active): 5 000 m
  - Pale Chanting Goshawk: 500 m
  - Jackal Buzzard: 500 m
  - Rock Kestrel: 500 m
  - Rufous-breasted Sparrowhawk: 500 m
  - Unidentified raptor or corvid nest: 1500 m
  - Verreaux's Eagle roost: 1000 m

Avifaunal Sensitivity Zones were designated based on observed flight activity during 2 x 12 months of avifaunal monitoring sessions on the WEF site (one from 2013/14, the other from 2016/17). All flights recorded across two years of monitoring were combined and analysed in GIS to determine sensitive areas based on flight activity.

The results of 12 months of avifaunal monitoring were combined with the results of the initial monitoring and used to produce an updated and combined Flight Sensitivity Map (Figure 9.5) and to identify no-go areas (Figure 9.6). It was recommended that turbines and overhead power lines are not placed within the "No-go for turbine and overhead powerline placement" shown in Figure 9.6. No turbines should be constructed in all Avifaunal No-go Buffers. The current proposed layout adheres to this recommendation (see Figure 9.10).

These areas informed the placement of turbines in the revised turbine layout, with all turbines in the revised layout being placed outside of high or medium-high flight sensitivity areas. This area covers grid cells with a flight sensitivity score of High or Medium-High, buffered by 100 m and 50 m respectively (to allow for some error in observer accuracy). These areas are where most priority species, especially Verreaux's Eagle undertook most of their flights at risk height, and constitute areas that are likely to have higher risk of collisions. It was recommended that the hierarchy of sensitivity scores presented in the Flight Sensitivity Map be considered, with preferential turbine placement in areas with Low Sensitivity areas, followed by Medium Sensitivity areas. This, to a large degree has been adhered to in the revised layout, with most turbines located in low flight sensitivity zones, some in medium zones, and none in medium-high or high sensitivity zones.

11.10.3 Ecology

The revised layout of the Phase 1 and Phase 2 projects are illustrated below in Figure 9.4, with the sensitivity map of the study area. The revised layout has been carefully inspected and reviewed to assess potential impacts to sensitive features at the site. Compared to the original layout, significant improvements are evident with regards to avoidance of sensitive ecological features at the site. There are <u>no turbines in no-go areas or areas considered unsuitable for turbine placement</u>. Apart from the large reduction in the extent of the road network, which is seen as a positive step, there are no roads which traverse no-go areas. While there are some roads which traverse minor drainage systems, crossings have been reduced as far as possible and the remaining crossings are not avoidable and are considered acceptable. As such, the revised layouts are considered well-mitigated and will significantly reduce the impact of the development on the terrestrial environment compared to the original project layouts.

12 UPDATED CUMULATIVE ASSESSMENT ON REVISED TURBINE LAYOUT

12.1 Aquatic

Overall cumulative impact during the construction and operational phases. In the assessment of this project, the surrounding projects within a 35km radius of the site were assessed. All of the projects have indicated that this is also their intention with regard mitigation, i.e. selecting the best possible routes to minimise the local and regional impacts, and improving the drainage or hydrological conditions with these rivers so that the cumulative impact would be negligible. However, the worse-case scenario has been assessed below, i.e. only the minimum of mitigation be implemented by the other projects, noting only a small number of projects ever reach the construction phase and that flows within these systems are sporadic.		
	Without mitigation	With mitigation
Reversibility	Yes (high)	Yes (high)
Irreplaceable loss of resources	Yes (medium)	Yes (low)
Can impacts be mitigated	Yes (high)	
Mitigation: Improve the current stormwater and energy dissipation features not currently found along the tracks and roads within the region Install properly sized culverts with erosion protection measures at the present road / track crossings		
Residual impacts: Residual impacts will be negligible after appropriate mitigation.		

	Extent	Duration	Severity	Status	Significance	Probability	Confidence
Without Mitigation	Local (L)	Medium term (M)	L-	Negative	Medium (-)	High	High

With Mitigation	Local (L)	Short term (L)	L-	Negative	Low (-)	Low	High

12.2 Flora and Fauna

The main projects in the area include the adjacent Trouberg Wind Energy Facility and further to the west around the Gamma Substation is the Mainstream Victoria West Wind Energy Facility which would consist of several 140MW phases. The only built project in the area is the Noblesfontein WEF which is about 75 km to the west of Umsinde. There are also a number of solar PV projects in the area, most notably the Aurora Power Solutions Betelgeuse projects at the junction of the N1 and R63 and the 19MW Biesiesfontein PV Project.

Regarding the interpretation of cumulative impact and the contribution of the current projects, there are a numbers of factors to be considered. The majority of projects in the area are located within the Eastern Upper Karoo vegetation type, which is the most extensive vegetation type in South Africa. As a result, the total cumulative impact of all renewable energy development within this vegetation type is very low when considered at the national scale. However, this vegetation type is very broadly conceptualized and contains a number of different subtypes, some of which may later prove to be different vegetation types altogether when properly studied. Thus, some consideration of local habitat types that are affected by the different renewable energy projects is required. In the area, the main drivers of vegetation change are soils and climate. In terms of soils, the Upper Karoo Hardeveld vegetation types occupies dolerite ridges that occur embedded within the Eastern Upper Karoo and as such are already captured as a different unit. However, there are also some strong altitudinal gradients in the area which affect the vegetation. The Umsinde Emoyeni projects are located at relatively high elevation and the majority of the development footprint is located at 1500-1600m. The other projects in the area tend to be on the lower elevation plains at 1200-1300m. As this is a somewhat different environment to Umsinde Emoyeni, these projects all contribute to cumulative impacts in the area, but there are some differences in the affected environment with the result that some habitats may be more affected than others. As the lower elevation plains is the predominant type in the area, the higher elevation areas are less extensive and considered more vulnerable to cumulative impact. Currently, there are the two Umsinde Emoyeni phases within this habitat type as well as the adjacent 140MW Ishwati Emoyeni WEF. However, the extent of this habitat is large and the Ishwati and Emoyeni developments would generate less than 300ha of habitat loss which is not significant. The areas to the east and especially the areas above 1800m are considered locally significant and contain a number of local endemics or species of conservation concern such as the Plain Mountain Adder *Bitis inornata* which is restricted to the high elevation peaks of the Nuweveldberge. These high elevation habitats would not be affected by the current developments.

Cumulative Impacts						
Impact 1. Impact on CBAs and Broad-Scale Ecological Processes	Before Mitigation	Medium	Probable	High	– ve	High
	After Mitigation	Medium	Probable	Low	– ve	High

12.3 Avifauna

The proposed Umsinde Emoyeni Wind Energy Facility is neighbouring the proposed Ishwati Emoyeni Wind Energy Facility and together these may contribute significantly to habitat fragmentation and disruptions of broad-scale ecological processes such as the dispersal and migration of species in response to fluctuations of local and regional climate (in the case that more than one of these proposed projects is constructed). If all three facilities are constructed they may present a barrier to movement of birds, particularly in the north-south direction. The extent of this impact depends on the final turbine layout and numbers of turbines constructed (at the three projects) and can be reduced if constraints corridors, such as those suggested around the Snyderskraal River in the east of the Ishwati Emoyeni Wind Energy Facility (CSIR 2014), remain free of turbines, and if the minimum number of turbines for each WEF phase at Umsinde constructed. It is important to note that due to the optimisation of the proposed wind energy projects' layouts based on a variety of environmental constraints and the wind resource and other economic factors, the layout of any one (or multiple projects) is unlikely to be a continuous string of turbines, because environmental constraints such as river valleys and topography result in breaks and corridors between the turbines.

12.3.1 Cumulative Assessment

Currently there are three further wind energy facilities (one of which includes a solar technology project component) under application or approved within a 50 km of the revised turbine development footprint. Whether any, or all of these will ever be constructed is unsure, however for the purpose of our assessment we assume that all three will become operational. They are:

- The proposed establishment of Modderfontein Wind Energy Facility on a site near Victoria West.
- The proposed development of the Mainstream wind and solar energy facility at Victoria West.
- The approved Ishwati Emoyeni Wind Farm Project.

Conducting a detailed cumulative impact assessment of all of these facilities together on a regional scale is beyond the scope of this specialist study and would need the input of all developers and specialists working on the above mentioned projects. Such an assessment is best undertaken by appropriate regional or national agencies in the context of strategic planning, and should not be required in the context of assessing a single proposal. In the scope of this study it is therefore difficult to say at this stage what the cumulative impact of all the proposed developments will be on birds because there is no cumulative baseline to measure against. The extent of actual impacts will only become known once a few wind farms are developed in the area and operational data becomes available, and noting that the developments considered may not all be constructed.

However, at a high level and with medium confidence, it can be said that if all of these facilities are approved and constructed they may present a very high significant threat to birds. Electrocutions, collisions with powerlines and wind turbines can potentially affect the viability of regional and even national populations, particularly of Verreaux's Eagle and Blue Crane. The extent of these impacts will depend largely on the final turbine numbers and layouts of each facility which can be reduced if turbine placement is informed by pre-construction monitoring and nest surveys, and the minimum number of turbines is constructed. Corridors, such as those suggested around the Snyderskraal River in the east of the Ishwati Emoyeni Wind Energy Facility (CSIR, 2014) and the high sensitivity areas identified by Smallie (2014), should remain free of turbines.

If all proposed projects implement appropriate mitigation measures as well as post-construction monitoring programmes and share the information gained from these, then the overall significance of the discussed impacts can be reduced. This may include the need for projects (or phases thereof) not yet built (but approved) to be stopped should already operational sites result in very high impacts (as agreed between the specialist in consultations with DEA, BLSA and the BARESG group) particularly to Verreaux's Eagle, Blue

Crane and Ludwig's Bustard. The significance of some cumulative impacts are likely to remain very high negative even after mitigation.

Cumulative Impact of Electrocution (Operation phase)

<table>
<tr><th></th><th>Extent</th><th>Intensity</th><th>Duration</th><th>Consequence</th><th>Probability</th><th>Significance</th><th>Status</th><th>Confiden</th></tr>
<tr><td>Without mitigation</td><td>Regional
2</td><td>High
3</td><td>Long-term
3</td><td>Very High
8</td><td>Probable</td><td>Very High</td><td>Negative</td><td>High</td></tr>
<tr><td colspan="9">Essential mitigation measures:
• Applicable specialist recommendations and mitigations are implemented on all projects considered.
• Pre-construction, construction (if applicable) and post-construction monitoring are implemented at all the new proposed projects considered, in accordance with the latest best practice guidelines.
• Results from monitoring must be assessed collectively with data from surrounding projects, and be made publicly available.
• Operational Results to advise phases/projects not yet constructed, and if unacceptable impacts (as agreed between the specialist in consultations with DEA, BLSA and the BARESG group) are observed, and can't be mitigated, further development on nearby sites should be re-considered.</td></tr>
<tr><td>With mitigation</td><td>Regional
2</td><td>Medium
2</td><td>Long-term
3</td><td>High
7</td><td>Improbable</td><td>Medium</td><td>Negative</td><td>Medium</td></tr>
</table>

Cumulative Impact of Power Line Collisions (Operation Phase)

<table>
<tr><th></th><th>Extent</th><th>Intensity</th><th>Duration</th><th>Consequence</th><th>Probability</th><th>Significance</th><th>Status</th><th>Confidence</th></tr>
<tr><td>Without mitigation</td><td>Regional
2</td><td>High
3</td><td>Long-term
3</td><td>Very High
8</td><td>Definite</td><td>Very High</td><td>Negative</td><td>High</td></tr>
<tr><td colspan="9">Essential mitigation measures:
• Applicable specialist recommendations and mitigations are implemented on all projects considered.
• Pre-construction, construction (if applicable) and post-construction monitoring are implemented at all the new proposed projects considered, in accordance with the latest best practice guidelines.
• Results from monitoring must be assessed collectively with data from surrounding projects, and be made publicly available.
• Operational Results to advise phases/projects not yet constructed, and if unacceptable impacts (as agreed between the specialist in consultations with DEA, BLSA and the BARESG group) are observed, and can't be mitigated, further development on nearby sites should be rec-considered.</td></tr>
<tr><td>With mitigation</td><td>Regional
2</td><td>High
3</td><td>Long-term
3</td><td>Very High
8</td><td>Possible</td><td>High</td><td>Negative</td><td>Medium</td></tr>
</table>

Cumulative Impact of Collisions from Wind Turbines

<table>
<tr><th></th><th>Extent</th><th>Intensity</th><th>Duration</th><th>Consequence</th><th>Probabilit</th><th>Significance</th><th>Status</th><th>Confidence</th></tr>
<tr><td>Without mitigation</td><td>Regional
2</td><td>High
3</td><td>Long-term
3</td><td>Very High
8</td><td>Definite</td><td>Very high</td><td>Negative</td><td>Medium</td></tr>
<tr><td colspan="9">Essential mitigation measures:
• Applicable specialist recommendations and mitigations are implemented on all projects considered.
• Pre-construction, construction (if applicable) and post-construction monitoring are implemented at all the new proposed projects considered, in accordance with the latest best practice guidelines.
• Post-construction monitoring results must be made publicly available and interpreted collectively with facilities in the area
• Operational Results to advise phases/projects not yet constructed, and if unacceptable impacts (as agreed between the specialist in consultations with DEA, BLSA and the BARESG group) are observed, and can't be mitigated, further development on nearby sites should be rec-considered.</td></tr>
</table>

With mitigation	Regional 2	High 3	Long-term 3	Very High 8	Probable	Very High	Negative	Low

12.4 Bats

Whilst it is very important to consider the local impacts that may be caused by individual developments; it is equally important to consider the cumulative impacts of the facility considering other similar developments nearby. Within 30km (the approximate nightly foraging distances of many bat species), there is another large WEF that has been approved immediately to the north-west. Within 100km (comfortably the distances some bat species move seasonally), there are at least another four WEFs that have been approved or are pending approval and several other renewable energy projects that are unspecified for now.

Whilst the DEA may request that a 30km radius is used for the assessment of cumulative impacts, this is not based on ecological processes and certainly does not take into account the larger seasonal distances that bats move. Hence, the bat specialist used 100km as a minimum distance for assessing the cumulative impact on bats.

Based on the specialists experience at nine operational WEFs in the Eastern Cape already, several bat species (of the same kind as found at Umsinde) are being killed by wind turbines. For example, *Tadarida aegyptiaca*, and *Neoromicia capensis* in the thousands each already and *Miniopterus natalensis* in the tens to hundreds already. SABAAP have developed a "living" and revisable (as new information comes available) Fatality Threshold Guideline (MacEwan *et al* 2017) that will guide specialists and developers on dangerous levels of fatality that would likely lead to population declines. IWS and SABAAP do not condone the killing of any bats, however, multiple fatalities of any species needs to be taken seriously and should warrant mitigation.

The greater the area of wind turbine development, the greater the impact will be on the high-risk species. IWS predicts some additive cumulative impact effect with each separate WEF being added to the region. Bat fatalities are concentrated to relatively fewer species than birds (in SA, only seven of the over 60 bat species to date have been found as fatalities at WEFs). Therefore, cumulated fatalities can potentially have significant impacts on their populations. (Barclay *et al*. 2017).

Population data are not likely to be available for most bat species in the near future and thus wind operators should practise the precautionary principle and avoid high-risk areas and implement operational minimisation measures at sites where bat fatalities are known or are predicted (Arnett & Baerwald 2013; Arnett, 2017). SABAAP has developed initial Threshold Guidelines to reduce the potential effects of cumulative impacts on bat populations and to avoid SA reaching the millions of bat fatalities that have been observed in the USA, Canada and Europe. These Threshold Guidelines should be used to inform adaptive management at Umsinde, based on operational monitoring results.

Arnett and Baerwald (2013) conducted a synthesis of bat fatality data from 122 post-construction fatality studies between the years 2000 to 2011 from 73 regional wind energy facilities in the USA and Canada. The findings estimated that cumulative bat fatalities for these 12 years amounted to between 650 104 to 1 308 378 and they predicted an additional 200 000 to 400 000 for the year 2012 alone. With growing numbers of operational wind turbines in North America, these fatality numbers are expected to grow annually. In Germany, between 2004 and 2015 (11 years), it is estimated that over two million bats have been killed by wind turbines (Voigt *et al*., 2015).

Whilst clustering WEFs may have grid infrastructure benefits, these benefits must not come at cost of irreversible negative cumulative environmental impacts. As several WEFs have already been approved for the area surrounding Murraysberg and Victoria West and several more are in the process of submitting applications, monitoring of the construction and operational phase impacts at already approved WEFs must be conducted to prove that the environmental impacts are not significant, before further facilities in the same area are approved. IWS supports the project in its current form but notes that there should be a staggered approach to the approvals, so learning can adequately inform future approvals.

12.5 Social

The proposed Ishwati Emoyeni WEF is located immediately to the west of the proposed Umsinde Emoyeni WEF site. The SIA (December 2015) noted that the potential for cumulative impacts associated with combined visibility (whether two or more solar facilities will be visible from one location) and sequential visibility (e.g. the effect of seeing two or more renewable energy facilities along a single journey, e.g. road or walking trail) is therefore high. However, due to the proximity of the two sites the WEFs could be viewed as a single large WEF as opposed to two separate WEFs. While viewing these WEFs as a single large facility, as opposed to separate facilities, does not necessarily reduce the overall visual impact on the scenic character of the area, it does reduce the potential cumulative impact on the landscape. Viewing each of the proposed WEFs as a single, large WEF eliminates the cumulative impacts associated with combined visibility (whether two or more wind farms will be visible from one location) and sequential visibility (e.g. the effect of seeing two or more wind farms along a single journey, e.g. road or walking trail). This therefore reduces the potential cumulative impact of the WEFs on the landscape. The proximity of the WEFs also has the benefit of concentrating the visual impacts on the areas sense of place in to one area as opposed to impacting on a number of more spread out areas. Despite this the significance was rated as Medium Negative with mitigation.

However, the potential impact of wind energy facilities on the landscape is an issue that does need to be considered, specifically given South African's strong attachment to the land and the growing number of wind facility applications. With regard to the area, a number of WEFs have been proposed in the Western Cape Province. The Environmental Authorities should therefore be aware of the potential cumulative impacts when evaluating applications.

The findings of the SIA (December 2015) also notes that in addition to the potential negative impacts, the establishment of the proposed WEF and other renewable energy projects in the area also has the potential to create a number of socio-economic opportunities for the town of Murraysburg and the BWLM, which, in turn, will result in a positive social benefit. The positive cumulative impacts include creation of employment, skills development and training opportunities, creation of downstream business opportunities. This benefit is rated as High Positive with enhancement.

Comment on implication of Revised Layout 2 (Phase 2) on cumulative impacts

Revised Layout 2 will result in the number of wind turbines associated Phase 2 being reduced from 98 to 35, a reduction of 63 turbines (64%). The reduced number of wind turbines will reduce the visual impacts associated with Phase 2, which, in turn, is also likely to reduce the potential for cumulative impacts. However, despite this the significance rating is likely to remain Medium Negative.

12.6 Visual

The currently proposed layout, with approximately 35 turbines in each of the 2 phases, would potentially have less of a cumulative visual effect than the previous layout with 98 turbines proposed in each phase.

The proposed Ishwati Emoyeni WEF (80 proposed turbines) adjacent to the project site, would increase the cumulative visual effect. Seen together, these WEF projects, along with their associated substations and powerlines, could have a significant visual effect on the visual character and scenic resources of the area.

The Victoria West WEF (30 wind turbines), the Noblesfontein WEF, (under construction), and the approved Modderfontein WEF, are all to the west of the N1, about 50km away, and would not be visible from the Umsinde Emoyeni project area.

There are now significantly fewer turbines (35) in each of the two phases than in the previous WEF proposals of 2015, the turbines have been moved further north, away from the Trouberg and sensitive receptors, distances from sensitive receptors have increased in many cases, and the viewshed is slightly less extensive, particularly towards the south. In addition, the fewer turbines would potentially result in slightly less visual clutter on the skyline, as well as fewer access roads and assembly platforms being required.

Therefore, the current layout is preferred for the reasons given above. It follows that the cumulative visual impact would also be slightly less for the current WEF proposals than for the previous 2015 proposals.

12.7 Heritage, Noise and Soils

The cumulative assessment as detailed in Section 10 remain the same.

13 PUBLIC PARTICIPATION

The first stage of public consultation was undertaken during the Scoping phase where the draft scoping report was made available for presentation and public review. The objective of this consultation was to inform the National, Provincial and local Government Authorities, relevant public, private sector entities, NGOs and local communities about the project and capture their initial views and issues of concern that will be important for the formulation of draft ToR.

The primary aims of the public participation process are:

- To inform Interested and Affected Parties (I&APs) of the proposed development;
- To identify issues, comments and concerns as raised by I&APs;
- To promote transparency and an understanding of the project and its potential consequences;
- To facilitate open dialogue and liaise with all I&APs;
- To assist in identifying potential environmental (biophysical and socio-economic) impacts associated with the proposed development; and
- To ensure that all I&AP issues and comments are accurately recorded, addressed and documented in an issues trail.

The public participation in the EIA phase has the following objectives:

- Inform I&APs about the EIA process followed to date;
- Present the specialist studies undertaken, impacts and proposed mitigation measures;
- Present the results of the Environmental Impact Assessment; and
- Collect concerns and expectations and take them into consideration in the EIA.

The public participation activities undertaken during this phase included:

- Updating the stakeholders' database prepared during the Scoping phase;
- A pre-notification to all registered I&APs of the availability of the Draft EIA report in December 2015 as well as a further notification in January 2016 that the Draft EIA was available.
- Public notification about the public meetings and availability of the Draft Report for review (newspaper adverts, invitations – Volume II);

- Copies of the Draft EIA for public review;
- Preparation of public and focus group meetings; and
- Public meeting held on 04 February 2016 at the Murraysburg Town Hall.

In December 2015, a notification was sent out to all registered I&APs that the draft EIA report will be out for public comment in early January 2016. On the 14 January 2016 all I&APs were notified that the report is available for review and comment. The report was available from 15 January 2016 at the following public locations for review.

Public Placement Venue	Address
Ubuntu Local Municipality	78 Church Street, Victoria West
Beaufort West Local Municipality	112 Donkin Street, Beaufort West
Richmond Ntsikelelo Tida Library	Bernie Groenewalt Street, Richmond
Richmond Police Station	Brink Street, Richmond
Beaufort West Local Municipality (Murraysburg Office)	23 Beaufort Street, Murraysburg
Murraysburg Farmers' Co-operative	36 Leeb Street, Murraysburg
Murraysburg Library	17 Beaufort Street Murraysburg 6995

Hard copies and electronic copies were sent to I&APs that requested it. The commenting period ran from 15 January 2016 to 24 February 2016. An additional ten days was granted to I&APs that requested an extension of the review period. During the comment period, focus group meetings were held with occupiers and land owners of the affected and surrounding land portions. A public meeting was held on 4 February 2016 at the Murraysburg Town Hall. The main comments received during this EIA phase of the process can be summarised as follows:

- Perceived exclusion of landowner occupiers from involvement in the EIA process;
- Objection to the content and the acceptance of the scoping land value report;
- Concern about the perceived manipulation of the EIA process by the EAP;
- Current struggles with power supply from Eskom;
- Request to be registered;
- Information requests and availability of the Draft EIA Report;
- Concern about the proximity of the proposed Ishwati Emoyeni WEF to the Umsinde Emoyeni WEF and cumulative impacts, particularly on bird species;
- Concerns about the adequacy of the avifauna specialist report;
- Request for extension of Draft EIA Report comment period;
- Request for clarity on the proposed Community Trust and development shareholding;
- Safety and security concerns during the construction phase of the project;
- Request for details on business opportunities during the operational phase of the project;
- Request for clarification of the impact assessment ratings (Methodology);
- Enquiry on whether additional public meeting/s will take place in Richmond or another venue;
- Enquiry on employment opportunities during the operational phase of the project;
- Concern about loss of current jobs due to the proposed Umsinde Emoyeni WEF;
- Concern regarding the negative impacts of the proposed project on current businesses (eco-tourism, local farming practices, game hunting, and other local businesses);

- Enquiry regarding a specialist study on bees;
- Enquiry on the determination of a project approval;
- Concerns regarding the impact of the proposed development on the land prices/ value of affected and surrounding farms;
- Request for exclusion of very high sensitive areas from the development footprint;
- Inclusion of Beaufort West and Richmond towns to positive economic development of the WEF as they have their own WEFs;
- Clarification on whether or not heritage resources are to be impacted by the proposed turbine positions or access roads;
- Concerns about presence of important birds species and habitat within the development study;
- Concern about social impacts on the town due to influx of workers;
- Concerns about negative visual impacts, ecological impacts and Sense of place;
- Concerns about dust and Air pollution;
- Concern about noise impact;
- Concern about the impact of the proposed development and existing infrastructure;
- Clarification on who comprises "project team";
- Avoidance of dusty areas from construction may affect the grazing rotation systems;
- Short term benefits versus long term impacts of the proposed project and
- Alternative renewable energy projects.

Volume II of this EIA report contains the public participation undertaken for this proposed development. Volume II contains the Issues and Responses Report, which expands on the comments received during the EIA phase, as well as the project team responses for each comment received. It is the opinion of the EAP that all issues and concern received throughout the EIA process (scoping phase and EIA phase) have been adequately addressed in this report, and adequately responded to in this Issues and Response Report.

Details of the above information is attached in a public participation report included as Appendix II.

13.1 Additional Public Review Period

As per the DEA rejection letter, this Revised Final EIA Report is being made available to registered I&APs for a 30 day review and comment period.

The public participation activities undertaken during this additional commenting phase include:

- Updating of the Issues and Response Report to include all comments received after the submission of the final EIAR Report in April 2016.
- Notification to all registered I&APs of the availability of the Revised Final EIA report in February 2018 for review and comment.
- Copies of the Revised Final EIA for public review;

The report is available from 09 February 2018 at the following public locations for review.

Public Placement Venue	Address
Ubuntu Local Municipality	78 Church Street, Victoria West
Beaufort West Local Municipality	112 Donkin Street, Beaufort West
Richmond Ntsikelelo Tida Library	Bernie Groenewalt Street, Richmond
Richmond Police Station	Brink Street, Richmond
Beaufort West Local Municipality (Murraysburg Office)	23 Beaufort Street, Murraysburg

Murraysburg Farmers' Co-operative	36 Leeb Street, Murraysburg
Murraysburg Library	17 Beaufort Street Murraysburg 6995
Website	www.arcusconsulting.co.za

The comment period to submit comments to the DEA will run from 09 February 2018 to 10 March 2018.

Details of the above information is attached in a public participation report included as Appendix II.

14 SUMMARY OF FINDINGS AND CONCLUSION

The major change in the layout of the Umsinde Emoyeni Phase 2 is a significant reduction in the overall footprint of WEF as a result of a decrease in the number of turbines as well as a reduction in the required length of access roads. In addition, significant further adjustment of the turbine and access road locations has been conducted to reduce impacts as far as possible.

The proposed development of a wind energy facility on the site will have a small impact on agricultural activities as the soils are of very low potential and only suited to extensive grazing. The turbine footprints are limited to rocky and shallow soil areas with very limited grazing potential.

The impacts on the site need to be viewed in the context of the country's energy mix and the negative externalities associated with current dominant energy sources such as coal, often in areas of high potential soils – such as the Eastern Highveld and the pollution that they produce. With this comparison in mind the impact of a wind energy facility is negligible compared to the damaging impacts of coal mining. Indeed wind energy is associated with positive externalities in the form of Economic Development benefits and the cheap tariff at which it is bought. Therefore, in perspective, the impacts of the proposed facility can be motivated as necessary in decreasing the impacts in areas where agriculture potential plays a more significant role and in the role that externalities associated with power production.

The potential noise impact was evaluated using a sound propagation model. Conceptual scenarios were developed for a construction and operational phase. The output of the modelling exercise indicated that there is low risk of a noise impact (low significance during all phases of the development)

From an ecological perspective examination of the revised layout revealed that there are no turbines in no-go areas or high sensitivity areas considered unsuitable for turbine placement. Apart from the large reduction in the extent of the road network, which is seen as a positive step, there are also no roads which traverse no-go areas. While there are some roads which traverse minor drainage systems, such crossings have been reduced as far as possible and the remaining crossings are not avoidable and are considered acceptable. As such, the revised layout is considered well-mitigated and will significantly reduce the impact of the development on the terrestrial environment compared to the original project layouts. The assessed impacts as assessed in the original study were reviewed based on the revised layouts and changes in baseline information for the study area. The review indicated that the only impact that warranted change as the cumulative impact of the Umsinde Emoyeni project on CBAs and broad-scale ecological process, which was adjusted from the previous assessed impact of HIGH to the revised impact of LOW. This change is warranted as a result of both the change in the layout of the two projects which has significantly reduced impact compared to the original projects and also the change in the CBA status of large parts of the site based on the latest CBA mapping for the Northern and Western Cape. Apart from the cumulative impacts on CBAs, cumulative impacts overall can be considered to be LOW as the affected vegetation type is very extensive and local-level cumulative impacts are still low and the more sensitive parts of the wider landscape are not within the development area.

The proposed layouts for the facility would seem to have limited impact on the aquatic environment as many of the proposed structures will avoid the delineated watercourses. Based on the condition of some of the present crossings, the project thus presents an opportunity to improve the flow and erosion protection were existing culverts / crossings do exist.

No aquatic protected or species of special concern (flora) were observed during the site visit, as well as any natural wetlands. Therefore, based on the site visit the significance of the impacts assessed for the aquatic systems after mitigation would be LOW. This is based on the assumption that the projects will have a limited impact on the aquatic environment and with monitoring of flows, erosion and sedimentation, although unlikely, downstream fish populations will not be impacted upon. This is also coupled to the fact that all of the project components have avoided the alluvial systems.

There are 31 potentially affected water courses crossing points that would trigger the need for a Water Use License application (a potential GA) in terms of Section 21 c and i of the National Water Act, should any construction take place within these areas. However, during the micro-siting process the **31 c**rossings could be reduced by moving some of the roads just outside of the buffer, i.e. these are not actual river crossing, and the proposed road is only within the buffer. This would also apply to the transmission line, once the positions of the towers are known

An additional 12 months of bird monitoring was conducted on site. Numerous Red Data species, endemic or near-endemic species and priority species were again recorded on the Umsinde Emoyeni WEF site in 2016/17. Generally, activity of these and other target species was found to be similar to the initial monitoring programme (Pearson, 2015). However, a slight increase in flight activity (per hour of VP survey effort) was noted for Verreaux's Eagle, while an increase in Blue Crane records and abundance was observed on the WEF site, which may be partly attributable to an increase in survey effort in certain locations favoured by this species. While no additional Verreaux's Eagle nests were located in 2016/17, activity of this species remained high on the WEF site. Some species of potential concern, e.g. Amur Falcon, Lesser Kestrel, Steppe Buzzard, Booted Eagle, Secretarybird and Black Harrier, were not recorded (or were recorded in lower than expected numbers/activity) during the additional monitoring.

The results of 12 months of avifaunal monitoring were combined with the results of the initial monitoring and used to produce an updated and combined Flight Sensitivity Map and to identify no-go areas. It was recommended that turbines and overhead power lines are not placed within the "No-go for turbine and overhead powerline placement". No turbines should be constructed in all Avifaunal No-go Buffers. The current proposed layout adheres to this recommendation (see Figure 9.10).

These areas informed the placement of turbines in the revised turbine layout, with all turbines in the revised layout being placed outside of high or medium-high flight sensitivity areas. It was recommended that the hierarchy of sensitivity scores presented in the Flight Sensitivity Map be considered, with preferential turbine placement in areas with Low Sensitivity areas, followed by Medium Sensitivity areas. This, to a large degree has been adhered to in the revised layout, with most turbines located in low flight sensitivity zones, some in medium zones, and none in medium-high or high sensitivity zones.

After consideration of the additional monitoring findings, and recent data regarding mortality of species at operational WEFs in South Africa, it was the specialists opinion that the initially proposed 196 turbines (across both phases combined) would cause (if all turbines are built) an unacceptably high impact to the regions avifauna, particularly on a cumulative level. <u>The number of turbines has significantly reduced from 196 to 70 turbines, across two phases, this from an avifauna perspective, is an acceptable number of turbines across the two phases of Umsinde.</u>

If unsustainable levels of mortality to key threatened species are realised (as agreed between the specialist in consultations with DEA, BLSA and the BARESG group), mitigations including turbine shutdown, and even possible turbine relocation may need to be considered (and enforced by the DEA where required).

It is noted here that as technology improves, the use of fewer, more powerful machines is possible, potentially resulting in a smaller development footprint and a lower probability of collision impacts for birds. Therefore it is unlikely that 70 turbines will be constructed, as the proposed project is 'up to 35 turbines per phase' and it is more likely that a lower number would be constructed. It is strongly recommended that the absolute minimum number of turbines to reach the required MW output be utilised.

All applicable mitigation measures and recommendations (where they are not in contradiction to, or superseded by those given in this report) in the avifaunal impact assessment report (Pearson, 2015) must be adhered to.

Several turbines that were originally situated in high bat sensitive areas have been moved to Low-Medium and Medium areas. No turbines, nor their full rotor swept zone are in or within 75 m of a High or Medium-High bat sensitive area. Whilst it is very important to consider the local impacts that may be caused by individual developments; it is equally important to consider the cumulative impacts of the facility in light of phased or other similar developments nearby. There should be a staggered approach to the environmental authorisations in a region, so learning can adequately inform future approvals. Perrold and MacEwan (2017) collated bat fatality data from across Year 1 studies at 10 operational WEFs from the Eastern, Northern and Western Cape Provinces of South Africa. For just that one year and only for a sub-set of the facilities, well over 1000 bats had been killed and this number continues to increase. This number is much higher now. The greater the number of turbines, the greater the potential for cumulative impact. Hence, keeping the number of turbines or the airspace occupied by rotor sweep as low as possible in order to meet the power requirements would be beneficial to bat populations. All mitigation measures in IWS (2015) and those specific measures superseded by IWS (2018) should be adhered to. The environmental authorisation (EA) to please also include all essential and best practise mitigation measures listed in this current report (IWS 2018) and those not amended from IWS (2015).

Cultural landscapes are highly sensitive to accumulative impacts and large scale development activities that change the character and public memory of a place. In terms of the National Heritage Resources Act, a cultural landscape may also include a natural landscape of high rarity value, aesthetic and scientific significance. The construction of a large facility can result in changes to the overall sense of place of a locality, if not a region. There will be high visibility of some turbines for a distance along local roads. A tangible change to sense of place will be experienced by farmer and road user however the impact will be reduced due to the lower number of turbines proposed. Major visual impacts to the R63 are avoided.

The findings of the SIA (Barbour December 2015) indicated that the development of the proposed Umsinde Emoyeni WEF (Phase 2) would create employment and business opportunities for the local economy, specifically during the construction phase. However, for the community of Murraysburg and other local towns in the area to benefit from these opportunities will require the implementation of an effective training and skills development programme prior to the commencement of the construction phase and a commitment from the proponent to achieve local employment targets for low and semi-skilled jobs. The establishment of a Community Trust would also benefit the local community. The proposed development also represented an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole.

The SIA also noted that the potential visual impacts associated with the proposed Umsinde Emoyeni WEF (Phase 1 and 2) could be effectively addressed by ensuring that no wind turbines are visible from the Farm Badsfontein, there are no turbines that are visible from Badsfontein Farm from Phase One Development. In addition, the recommendations contained in the VIA should be implemented.

Based on these findings the SIA recommended that the Umsinde Emoyeni WEF (Phase 1 and 2) be supported, subject to the implementation of the recommended mitigation measures and management actions contained in the SIA and VIA Report.

Revised Layout 2 for Phase 2 will result in the total number of wind turbines being reduced from 98 Phase (original proposal) to 35. The total number of wind turbines associated with Phase 1 and 2 will therefore be 70 as opposed to 196. This represents a significant reduction. While the reduction in wind turbines will reduce the number of employment opportunities associated with the construction and operational phase, it will also reduce the visual and cumulative impacts of the proposed Umsinde Phase 1 and 2 WEF on the areas sense of place. This is regarded as an overall improvement.

The recommendations contained in the December 2015 SIA (Barbour, December 2015) therefore remain valid, namely that the establishment of the Umsinde Emoyeni WEF (Phase 1 and 2 Revised Layout 2) be supported, subject to the implementation of the recommended mitigation measures and management actions contained in the SIA (December 2015) and VIA Report.

It is therefore recommended that the Umsinde WEF (Phase 2) be supported, subject to the implementation of the recommended mitigation measures and management actions contained in the SIA and VIA Report and the EMPR.

It is difficult to mitigate the visual effect of a wind energy facility of this size, except by eliminating or relocating some of the turbines, which to a large extent has been done, with the reduction in the number of turbines from 98 to 35.

Using the assessment methodology described above, it was determined that the visual impact significance of the Phase 2 WEF would be similar to the previous layout, i.e. high before mitigation, given the number of wind turbines (up to 35 turbines) and the large size of turbines. The visual effect of the proposed WEF has been partly reduced through the elimination and relocation of many of the turbines. Buffers around topographic features, settlements and roads have been recommended and these mitigations have been implemented in the current layout, resulting in the potential visual impact significance being reduced to medium.

Associated infrastructure, such as access roads, substation and maintenance buildings could also be mitigated and would have a similar medium significance rating.

The construction phase of the WEF and associated infrastructure would be short-term (<2 years) and would potentially have a low visual significance rating.

The social impact assessment, the visual impact assessment as well as the heritage impact assessment have all taken this into account in their assessment report.

The proposed related infrastructure, such as powerlines, access roads, substation and O&M buildings may result in potential visual intrusion of the industrial infrastructure on the Karoo's rural 'sense of place'.

The visual impact and the significance thereof associated with a 140 MW WEF on the areas sense of place is likely to vary from individual to individual.

Although this landscape has been assigned a high grade in terms of its quality, the proponent has gone to some lengths to design phase 2 to involve the most inhospitable and remote parts of the project area which means that much of the high scenic amenity value areas will be conserved albeit that elements of the proposed facilities will be visible. Farms situated on the valley floors will probably not be seriously impacted to changes in sense of place, although the overall natural qualities of the project areas and aesthetic qualities will be impacted.

The remoteness of areas selected for especially phase 2 of Umsinde Emoyeni has mitigated somewhat this impact.

15 IMPACT STATEMENT

The proposed Umsinde Emoyeni WEF Phase 2 has the potential to provide much needed renewable energy to the country's grid. The use of renewable energy to provide power to South Africa is supported at International, National, Provincial and Local Government Levels. Further, given South Africa's need for additional electricity generation and the need to decrease the country's dependency on coal-based power, renewable energy has been identified as a national priority, with wind energy identified as one of the most readily available, technically viable and commercially cost-effective sources of renewable energy.

The potential positive impacts associated with the proposed project is further recognised through the creation of jobs for the local community, and the positive contributions to the socio-economic development of the surrounding areas and local communities.

Should the Umsinde Emoyeni WEF be developed, the actual physical footprint of the wind turbines and associated onsite infrastructure will occupy an area of land equivalent to less than 1% of the total project area. Small livestock grazing and other agricultural activities can continue in parallel with the operation of the turbines. The project will have no significant impact in terms of loss of agricultural productivity. Should the mitigation measures identified by specialists and the recommendations of the EMPr be effectively implemented the negative impacts associated with the proposed project will be significantly reduced.

Overall the development will have a moderate to low impact after mitigation and with the implementation of the recommended mitigation measures, impacts will be reduced to acceptable level, from an ecological perspective. As the impacts on broad-scale processes in particular have been reduced, the need for some sort of on-site conservation management action as originally recommended is seen as no longer necessary. The overall conclusion reached with regards to the Umsinde Emoyeni Phase 2 is that "The ecological impacts associated with the development of the Umsinde Emoyeni Phase 2 will generally be low after mitigation. There are no fatal flaws or high impacts associated with the development that cannot be reduced to a low level. As such, the development of the Umsinde Emoyeni Phase 2 is considered to be ecologically acceptable and there are no ecological considerations that should prevent the projects from being approved."

The developer must ensure that turbines that have been identified by specialists are moved, during the final design, and micro-siting phases. Operational phase monitoring of birds must be undertaken according to applicable avifaunal guidelines current at the start of the operational phase. The same should be applied for the operational phase monitoring of bats. The monitoring should not be undertaken according to those guidelines that are current at the time of the environmental authorisation. The information collected during the operational monitoring must be shared with Bird Life SA and EWT, as well as the South

African Bat Association Panel (or any other agency that comes into effect, which centrally collects information to inform the effects of WEF on birds and bats). Monitoring and carcass searching must be undertaken throughout the life span of the development, at an agreed frequency with specialists.

All recommendations and mitigations must be complied with and adhered to.

Taking into consideration the findings of the EIA process for the proposed development and the fact that recommended mitigation measures have been used to inform the project design, and the layout of the facility has sinficantly reduced from 98 turbines to 35, it is the opinion of the Environmental Assessment Practitioner (EAP) that the majority of negative impacts associated with the implementation of the proposed project have been mitigated to acceptable levels. While the residual visual impact and the loss of "sense of place" of the project will have an impact on local receptors, the extent of the benefits associated with the implementation of the projects will benefit a much larger group of people, in terms of renewable energy supply and positive local and regional economic impact.

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REVISED FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED UMSINDE EMOYENI WIND ENERGY FACILITY

PHASE TWO

APPENDIX A: EAP CV

WESTERN AND NORTHEN CAPE PROVINCES

DEA REF: 14/12/16/3/3/2/687

On behalf of
EMOYENI WIND FARM PROJECT (PTY) LTD

February 2018

APPENDIX 9
9.1 DECLARATION OF THE EAP

I, Ashlin Bodasing, declare that –

- I act as the independent environmental assessment practitioner in this application;
- I have expertise in conducting environmental impact assessments, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I will take into account, to the extent possible, the matters listed in Regulation 18 of the Regulations when preparing the application and any report relating to the application;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority, unless access to that information is protected by law, in which case it will be indicated that such information exists and will be provided to the competent authority;
- I will perform all obligations as expected from an environmental assessment practitioner in terms of the Regulations; and
- I am aware of what constitutes an offence in terms of Regulation 48 and that a person convicted of an offence in terms of Regulation 48(1) is liable to the penalties as contemplated in section 49B of the Act.

Disclosure of Vested Interest (delete whichever is not applicable)

- I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Regulations;

- ~~I have a vested interest in the proposed activity proceeding, such vested interest being:~~

____

____

____

____

ABodasing

Signature of the environmental assessment practitioner

Arcus Consultancy Services

Name of company:

07 February 2018

Date

AB 1.1.6

APPENDIX 9
9.2 UNDERTAKING UNDER OATH/ AFFIRMATION

I, Ashlin Bodasing, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the environmental assessment practitioner

Arcus Consultancy Services
Name of company

07 February 2018
Date

Signature of the commissioner of oaths

07.02.2018
Date

James Joseph Emslie
Commissioner of Oaths
Practising Attorney SA
ENSafrica
1 North Wharf Square
Loop Street Cape Town 8001

CURRICULUM VITAE

Ashlin Bodasing

Technical Director and Environmental Assessment Practitioner

Email: ashlinb@arcusconsulting.co.za Tel: +27 (0) 21 412 1529

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Specialisms

- Environmental Impact Assessments
- Environmental Management Plans
- Environmental Feasibility Studies
- Environmental Due Diligence and Compliance
- Client Relationship Management

Summary of Experience

Ashlin Bodasing is a Technical Director at Arcus Consultancy Services South Africa (Pty) Ltd. She manages the Arcus South African office and the team based in Cape Town.
Having obtained her Bachelor of Social Science Degree (Geography and Environmental Management) from the University of Kwa-Zulu Natal; she has over eleven years' experience in the environmental consulting industry in southern Africa. She has gained extensive experience in the field of Integrated Environmental Management, environmental impact assessments and public participation. She has also been actively involved in a number of industrial and infrastructural projects, including electricity power lines and substations; road and water infrastructure upgrades and the installation of telecommunication equipment, green and brown field coal mines, as well as renewable energy facilities, both wind and solar. Ashlin has excellent Project Management experience and has gained major project experience in the development of Environmental Impact Assessments, Environmental Management Plans and the monitoring of construction activities. Her areas of expertise include project management, environmental scoping and impact assessments, environmental management plans, environmental compliance monitoring and environmental feasibility studies. Experience also includes International Finance Corporation Performance Standards and World Bank Environmental Guidelines environmental due diligence reviews. She has worked in Mozambique, Namibia, Botswana, Lesotho and Zimbabwe.

Professional History

2017 – Present – Technical Director, Arcus Consultancy Services South Africa
2015 - 2017 – Team Leader, Arcus Consultancy Services Ltd
2012 – 2015 – Lead Environmental Officer, Tweefontein Optimisation Project, Glencore / Xstrata Coal Mine, Witbank, Mpumalanga, South Africa (secondment)
2007-2015 - Senior Environmental Assessment Practitioner, Parsons Brinckerhoff Africa
2005-2007 – Environmental Consultant, WSP Environment and Energy

Ashlin spent over 2 years at the Glencore (previously Xstrata Coal SA) – Tweefontein Optimisation Project, as the sole environmental officer permanently on site overseeing all their construction projects, ensuring contractor compliance to EMP and Environmental Authorisations. This included the construction of the internal and external infrastructure packages. Roles include ensuring all construction and development are in line with the EIA and EMP for the project. Areas of responsibility include the Mine Infrastructure Area, the Explosives Magazine Area, construction of a secondary school, construction of residential houses, and the rail load out facility. Role also included review of environmental impact assessment applications and reports submitted to the department of environmental affairs for the project.

Qualifications and Professional Interests

- University of Kwa-Zulu Natal, 2004
  Bachelor of Social Science (Geography and Environmental Management)

Project Experience

Environmental Impact Assessments

- San Kraal Wind Energy Facility, 2016- present. Project Director (client liaison) and EAP.

- Phezukomoya Wind Energy Facility, 2016 – present. Project Director (client liaison) and EAP.
- Kolkies and Karee Wind Energy Facilities, 2016-2016. Project Director (Client liaison) and EAP.
- Komsberg East and West Wind Energy Facilities 2015-2016. Project Director (Client Liaison) and EAP.
- Umsinde Emoyeni Wind Energy Facilities – 2015- present. Project Director (Client Liaison) and EAP.

Ecological Impact Assessments and Monitoring

- Komsberg Wind Farms, 2015-2016. Project Director (Client Liaison), coordination and management of ecologists (bird and bat), review of techncial and specialists impact assessments.
- Kolkies and Karee Wind Energy Facilities 2015-2016. Project Director (Client Liaison), coordination and management of bird and bat specialists and review of technical and impact assessment reports.
- Umsinde Wind Energy Facilities, Additional Bird Monitoring. Project Director. Coordination and management of bird specialists and review of technical reports.
- Kap Vley Wind Energy Facility, Bird and Bat Pre-Construction Monitoring. Project Director. Coordination and management of bird and bat specialists, review of technical reports.
- Highlands Wind Energy Facility, Bird and Bat Pre-Construction Monitoring. Project Director. Coordination and management of bird and bat specialists, review of technical reports.
- Hopefield Wind Farm –Operational Monitoring. Project Manager. Coordination and management of bird and bat specialists, review of technical reports.
- Gouda Wind Farm – Operation Monitoring. Project Director. Coordination and management of bird and bat specialists, review of technical reports.

Feasibility Studies and Due Diligence Reviews

- Ecological due diligence for IFC PS6 – Wind Energy Developments: Project Manager. Review and reporting on bird and bat specialist reports to IFC/World Bank Standards – Various sites across South Africa.
- Power Plant – Ghana. Project Manager Compilation of environmental due diligence for refinancing, IFC and World Bank Standards, on behalf of Botswana Development Corporation.
- Ecological Feasibility Study. Project Director. Review of the feasibility of a site for a wind energy facility in relation to bats.
- Environmental Feasibility Study. Project Director and EAP. Review of a proposed site for the development of industrial facility.

Previous Project Experience

Environmental Scoping and Impact Assessments and Project Management for:

- eThekwini Municipality
- Moreland Developments
- RBCH – Bulk Materials and Handling Facility
- SAPREF
- Mittal Steel Permit Amendment
- Transnet Projects
- ArcelorMittal South Africa
- MCA-Lesotho
- Talbot Group Holdings (Australian Mining Company)

- Ncondezi Energy – Mozambique

Environmental Management Plans and Compliance Monitoring

- Nongoma Road Monitoring – Compliance Monitoring
- eThekwini Municipality - Taxi Holding Areas: Canberra Road and Umgeni Road Compilation of the EMP; and Bi-monthly compliance monitoring (site visits) and reporting.
- EMP for Kwezi V3 - Kwamashu Fuel Tank Exemption
- eThekwini Municipality - Ridgeview Road – Compliance Monitoring
- eThekwini Municipality and Merz and Mclellen - Phoenix Overhead Transmission Lines – Compliance Monitoring
- eThekwini Municipality and Merz and Mclellen - E8546 E8699 Compliance Monitoring
- eThekwini Municipality and Merz and Mclellen - Environmental Assessment and EMP
- EMP for eThekwini Municipality - Parlock Switching Station

Training and Auditing

- Petronet Alien Plant Training - Compilation of the training material for alien plant identification and removal methods.
- eThekwini Municipality - Taxi Holding Areas – Canberra and Umgeni Road - Contactor and workforce training.
- eThekwini Municipality - Kingsway Road Taxi Rank - Contactor and workforce training.

Environmental Reviews / Terms of Reference

- Biotherm Energy - Environmental Project Manager: Independent review of environmental impact assessment reports and management plans compiled for 3 wind farms in the Western Cape and 2 PV Solar Plants in the Northern Cape, to ensure compliance to IFC and World Bank Standards.
- Government of Zimbabwe – Hwange Power Station - Environmental Project Manager: Compilation of the Terms of Reference for Environmental Management Plan and Environmental and Social Audit of the Hwange Power Plant in Zimbabwe.

Pre-Feasibility Studies

- Pre-feasibility studies for eThekwini Municipalit, Investec, Sekoko Coal Resources, Mulilo, Sekoko Mining and MCA-Lesotho for renewable energy, coal mines and power plants.

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REVISED FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED UMSINDE EMOYENI WIND ENERGY FACILITY

PHASE TWO

APPENDIX B: ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

WESTERN AND NORTHEN CAPE PROVINCES

DEA REF: 14/12/16/3/3/2/687

On behalf of
EMOYENI WIND FARM PROJECT (PTY) LTD

February 2018

Prepared By:

Arcus Consultancy Services
Registered in South Africa No. 2012/215000/10

Glossary of Terms

Construction Phase: The activities pertaining to the preparation for and the physical construction of the proposed development

Contractor: Persons/organisations contracted by the Developer to carry out parts of the work for the proposed project

Engineer / Project Director (PD): Person/organisation appointed by the Developer to oversee the work of all consultants, sub-developers, contractors, residents and visitors.

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

Environmental and Social Manager (ESM) also known as the Environmental Control Officer (ECO): Person/organisation appointed by the Developer who will provide direction to the Principal Agent concerning the activities within the Construction site. The ECO will also be responsible to liaise with the independent auditor who will conduct an environmental audit during the construction phase of the project according to the provisions of the Environmental Management Programme.

Independent Auditor: The person or entity who will conduct an environmental audit during the construction phase of the project according to the provisions of the Environmental Management Programme and Environmental Authorisation.

Environmental Management Programme (EMP): The EMP is a detailed plan for the implementation of the mitigation measures to minimise negative environmental impacts during the life-cycle of a project. The EMP contributes to the preparation of the contract documentation by developing clauses to which the contractor must adhere for the protection of the environment. The EMP specifies how the construction of the project is to be carried out and includes the actions required for the Post-Construction Phase to ensure that all the environmental impacts are managed for the duration of the project's life-cycle.

Therefore the EMP will be a working document, which will be reviewed when necessary, or if required by the authorities. A revision will be done once the detailed design of the proposed development has been completed.

Operational Phase (Post Construction): The period following the Construction Phase, during which the proposed development will be operational.

Pre-Construction Phase: The period prior to commencement of the Construction Phase, during which various activities associated with the preparation for the Construction Phase: detailed final designs, micro siting, etc. will be undertaken.

Rehabilitation: Rehabilitation is defined as the return of a disturbed area to a state which approximates the state (where possible) which it was before disruption. Rehabilitation for the purposes of this specification is aimed at post-reinstatement revegetation of a disturbed area and the insurance of a stable land surface. Revegetation should aim to accelerate the natural succession processes so that the plant community develops in the desired way, i.e. promote rapid vegetation establishment.

Site Manager: The person, representing the Contractor, responsible for all the Contractor's activities on the site including supervision of the construction staff and activities associated with the Construction Phase.

Project Area: This refers to the authorised area for the proposed development to take place. Farm portions numbers are outline in the EMP.

Local Community: People residing or present in the region and near the construction activities, including the owners and/or managers of land affected by construction, workers on the land, and people in nearby towns and villages.

Public: Any individual or group concerned with or affected by the Project and its consequences, including the local community, local, regional, and national authorities, investors, workforce, customers, consumers, environmental interest groups, and the general public.

Construction Area / Site: The land on which the Project is to be located. It includes the site, construction campsite, access roads and tracks, as well as any other area affected or disturbed by construction activities. The EMP (particularly the specifications for rehabilitation) is relevant for all areas disturbed during construction.

Access Roads and Tracks: All newly established roads and tracks, and areas cleared or driven over to provide access to/from the construction areas, and for the transportation of the construction workforce, equipment and materials.

Environmental Impact: The effect of an activity on the environment, whether desirable or undesirable. Undesirable or negative environmental impacts will result in damage and/or pollution of, or detriment to the environment, or in danger to the public, whether immediate or delayed.

Environmental Incident: An unexpected or sudden occurrence related to the Project, including major emissions, spills, fires, explosions, floods or erosion leading to serious or potentially serious negative environmental impacts.

Fugitive Dust: Can be defined as natural and/or human-associated dust becoming airborne due to the forces of wind or human activity.

Fauna and Flora / Plants and Animals: Any individual or group of micro-organisms, plants or animals.

General Waste and Construction Rubble It includes waste paper, board, cardboard, benign organic and domestic waste and uncontaminated construction debris such as used bricks, wood, waste concrete, unused subsoil and rubble from excavations or demolished structures.

Heritage Sites and Artefacts: Heritage sites and artefacts can be defined as any object or site of cultural, historical, archaeological or palaeontological significance found in or on the land. Historical objects are objects older than 50 years with architectural, historical, scientific, cultural, social, spiritual, linguistic, technological or aesthetic value. For example: buildings or parts thereof, graves or burial sites, milestones, numismatic objects (i.e. coins and beads), and military objects.

Archaeological objects include material remains resulting from human activity which are older than 100 years and which are in a state of disuse, such as tools, artefacts, human and hominoid remains and artificial features and structures.

Palaeontological objects include any fossilised remains of animals or plants.

Hazardous Substances: Substances which are potentially dangerous and may affect human and/or environmental health. This would be because of the substances' inherent chemical and physical composition, which could be toxic, poisonous, flammable, explosive, carcinogenic or radioactive. Hazardous waste includes, but is not limited to: human excrement, the by-products and wastes associated will the use of hazardous substances (i.e. used fuel, oil, lubricants and solvents), as well as items such as spent batteries, old oil filters, light bulbs, tyres, circuit boards, etc. which requires special collection and handling. When left abandoned, even substances such as scrap metal, wire, tins, broken glass and plastic could be harmful to people, wild and domestic animals. For example: plastic could be ingested by animals; people and animals could be injured by broken glass or metal objects; and animals could get trapped in drums, tins and bottles or get entangled in plastic or metal wiring. Even if buried, such objects may become exposed over time due to wind erosion, scavengers or future human activities. Because of the sensitive nature of the area, these substances are all regarded as 'hazardous waste' for the purposes of this EMP.

Hydrological Features: Hydrological features include, but are not limited to:

- wetlands;
- open water;
- vegetated drainage channels;
- subterranean water;
- marine environments;
- estuarine environments.

Life Support Systems: Life support systems include, but are not limited to: an ecological system in which its outputs are vital for sustaining specialised habitats; an ecological system in which its outputs are vital for sustaining human life (e.g. water purification).

Mitigation: Environmental management measures designed to avoid, limit or remedy undesirable environmental impacts.

Monitoring: Structured observation, measurement and evaluation of environmental data over a period of time to assess the efficiency of environmental mitigation and rehabilitation measures.

Rehabilitation: Measures implemented to restore a damaged Environment.

Sensitive Sites: Environmentally sensitive sites include, but are not limited to:

- Areas with high conservation value due to the presence of important plant specimens, pristine habitats, high biodiversity, important water resources or heritage features and artefacts;
- Areas particularly prone to erosion once disturbed (i.e. steep slopes);
- Vulnerable areas with low potential for rehabilitation / slow rate of recovery (i.e. rock outcrops, steep slopes); and
- Areas in close proximity of sensitive receptors, such as farm homesteads, viewpoints or tourist stopovers.

Specialised habitats: Specialised habitats include, but are not limited to, areas which are:

- Priority breeding habitats;
- Refuge areas;
- Vital for species survival (important for, part, or all of its life cycle);
- Essential for species performance;
- Cryptic habitats, etc.

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1 INTRODUCTION

1.1 Background

Emoyeni Wind Farms (Pty) Ltd is proposing to develop 2 x 140 MW wind energy facilities, on a site near Murraysburg, on the border of the Western and Northern Cape Provinces, South Africa.

This document must be seen as dynamic, and be updated when and if required, throughout the lifecycle of the project.

The Environmental Management Plan (EMP) outlines measures to be implemented in order to minimise adverse environmental degradation associated with construction of the proposed development. It serves as a guide for the contractor and the construction workforce on their roles and responsibilities concerning environmental management on site, and it provides a framework for environmental monitoring throughout the construction period.

1.2 Details of the Applicant and the Environmental Assessment Practitioner

Details of Applicant	
Project Applicant	Emoyeni Wind Farms Propriety Limited
Company Registration	
Contact Person	Peter Venn
Postal Address	Postnet Suite No 216. Private Bag X26 Tokai 7966, Cape Town
Telephone	021 701 1292
Fax	
Email	

Environmental Assessment Practitioner	
EAP	Arcus Consultancy Services Ltd
Contact Person	Ashlin Bodasing
Qualifications	BSocSci Geography and Environmental Management
Postal Address	
Telephone	021 412 1529
Fax	None
Email	Office@arcusconsulting.co.za

1.3 Purpose and Aims of this Document

According to the Western Cape's Department of Environmental Affairs and Development Planning, Guideline for Environmental Management Plan (2005), and Environmental Management Programme (EMPr) is defined as "an *environmental management tool used to ensure that undue or reasonably avoidable adverse impact of the construction, operation and decommissioning of a project are prevented or mitigated, and that the positive beneifits of the project are enhanced."*

This EMPr outlines measures to be implemented in order to minimise adverse environmental degradation and enhance positive impacts associated with wind energy facility. It serves as a guide for the contractor and the workforce on their roles and responsibilities concerning environmental management on site, and it provides a framework for environmental monitoring throughout the construction and operational periods. The purpose of the EMPr is to:

- Encourage good management practices through planning and commitment to environmental issues;

- Define how the management of the environment is reported and performance evaluated;
- Provide rational and practical environmental guidelines to:
- Minimise disturbance of the natural environment;
- Prevent pollution of land, air and water;
- Protect indigenous flora and fauna;
- Prevent soil erosion and facilitate re-vegetation;
- Comply with all applicable laws, regulations, standards and guidelines for the protection of the environment;
- Adopt the best practicable means available to prevent or minimise adverse environmental impacts;
- Identify and mitigate against any potential impact on ecology;
- Describe all monitoring procedures required to identify impacts on the environment; and
- Train employees and contractors with regard to environmental obligations.

1.4 The Proposed Project

The proposed Umsinde Emoyeni WEF phase 2 will comprise no more than 35 wind turbines, each turbine having a maximum installed capacity of up to 4.5 megawatts (MW). Turbines with a maximum height to tip of blade of 210 m will be considered (hub height of 135 m, rotor diameter up to 150 m). The proposed project will be located on the north east portion of the WEF site boundary (Figure 1.1)

The WEF Phase 2 will have a contracted capacity of up to 140 MW, and an installed capacity of up to 147 MW in line with the REIPPPP.

The location of the turbines is presented in Figure 1.2. The proposed locations were identified based on the constraints and sensitivity mapping conducted during the scoping phase. This allowed placement of turbines, in areas of moderate to low sensitivity. The road and turbine layout was used by the specialists to inform their impact assessment reports and significance rating.

The proposed project site covers an area of approximately 39 km^2, including internal roads, but excluding the grid connection. The grid site boundary connects the WEF with the Eskom Gamma substation. It should be noted that this is the same study area proposed for the grid infrastructure associated with the proposed Ishwati Emoyeni WEF (authorised by DEA). If the adjacent Ishwati Emoyeni WEF is awarded preferred bidder and constructed in advance of Umsinde Emoyeni, the preferred point of the grid connection may be on the Ishwati Emoyeni site (not at the Gamma substation). This would reduce the length of the power lines required to connect Umsinde Emoyeni to the national grid.

If awarded Preferred Bidder Status, the EWFP would enter into an implementation agreement with the DoE and a Power Purchase Agreement (PPA) with the buyer of the energy, which is in the majority of cases Eskom. Once operational the electricity would be sold to Eskom under the PPA at the agreed bid price. Eskom then distribute the energy through the national grid to the energy users.

1.5 Proposed Project Infrastructure Components

The proposed project will comprise the following components as described below. It should be noted as the final design of the proposed project is not yet finalised, all dimensions are maximums as is required by the EIA process. The final design may include infrastructure which is of equal or less than dimensions to those stated below but not more than.

1.5.1 Turbines

The proposed project will consist of up to a maximum 35 turbines. At this stage it is envisaged that the turbines will each have a capacity to generate 4.5 MW of power and each turbine will have a maximum height to blade tip of 210 m. The turbines will be three-bladed horizontal-axis design with a hub height of up to 135 m and a rotor diameter of up to 150 m. A typical wind turbine is presented below (Plate 1). The exact turbine model has not been selected yet and will be subject to competitive tendering after further wind analysis has been completed. The turbine model will depend upon the technical, commercial and site specific requirements.

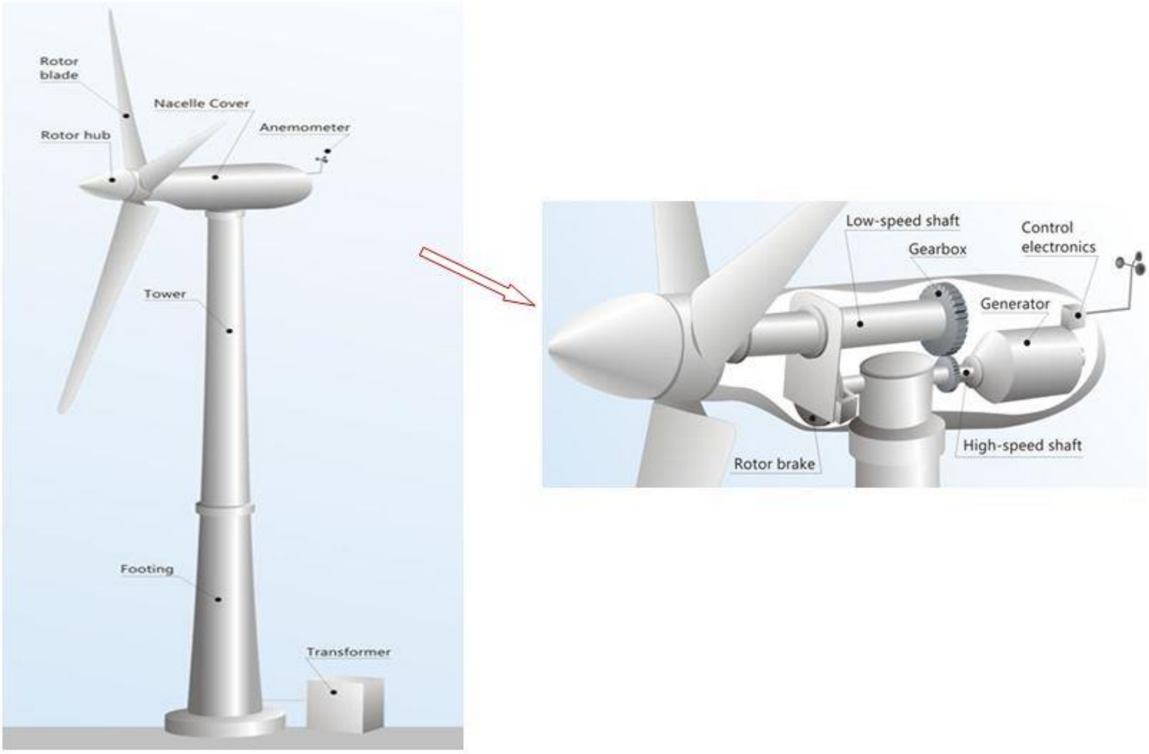

Plate 1 Typical Components of a Wind Turbine

The turbine rotor speed will vary according to the energy available in the wind, the wind speed. The turbines will generate power in wind speeds between approximately 3 metres per second (m/s) and 28 m/s (depending on the model of turbine) with maximum power output usually achieved at wind speeds of around 10 – 12 m/s. At average wind speeds greater than approximately 28 m/s the turbines would will automatically turn the angle of the blade to reduce energy capture (this is known as 'pitching') and stop turning to prevent damage.

Each turbine will require a transformer and, depending on the selected model of turbine, this will be either located within the turbine tower or adjacent to the turbine on a concrete plinth.

The turbines will be placed on steel and concrete foundations which will each occupy an area of up to 30 m by 30 m in total[1] (which includes the maximum total area that may need

1 Note this includes an increase in the 20 m by 20 m stated on the application forms submitted in April 2014. The 20 m by 20 m is the approximate area of the turbines foundation, however an area of up to 30 m by 30 m will need to be cleared for the installation of the turbines base, as such for the EIA we will be assessing a worst case scenario of 30 m by 30 m. Whilst this is an amendment to the application form it does not alter the Listed Activities applied for and will be assessed as the worst case at the EIA stage.

to be disturbed during construction of the foundation), and be typically up to 3 m deep and may include concrete and steel plinths depending upon local ground conditions.

Once construction is complete, much of the foundation area can be rehabilitated.

1.5.2 Hardstanding Areas

A hardstanding area of up to 45 m by 25 m will be established adjacent to each turbine location. This will be used to provide a platform for cranes to operate during construction (and unscheduled maintenance), as well as a clear area to lay out turbine components prior to erection.

1.5.3 Laydown Areas

Up to three additional temporary laydown areas of up to 150 m by 60 m in size will be required for equipment and component storage during construction. These areas will be levelled and compacted and used for component storage.

1.5.4 Electrical Cabling and Onsite Substation

The electricity from the turbines will be transferred via a 33 kV electrical network to a 33/ 132 kV onsite substation. Where feasible and possible this will be underground. The onsite substation will house electrical infrastructure such as transformers and switch gear to enable the energy to be transferred into the existing national grid. At this stage it is not clear which components of the onsite substation, will be transferred to ESKOM, as part of the grid connection, and transmission and distribution, therefore the substation, is included in all four applications and assessed in all four impact assessments. Typical example of a substation is shown below (Plate 2).

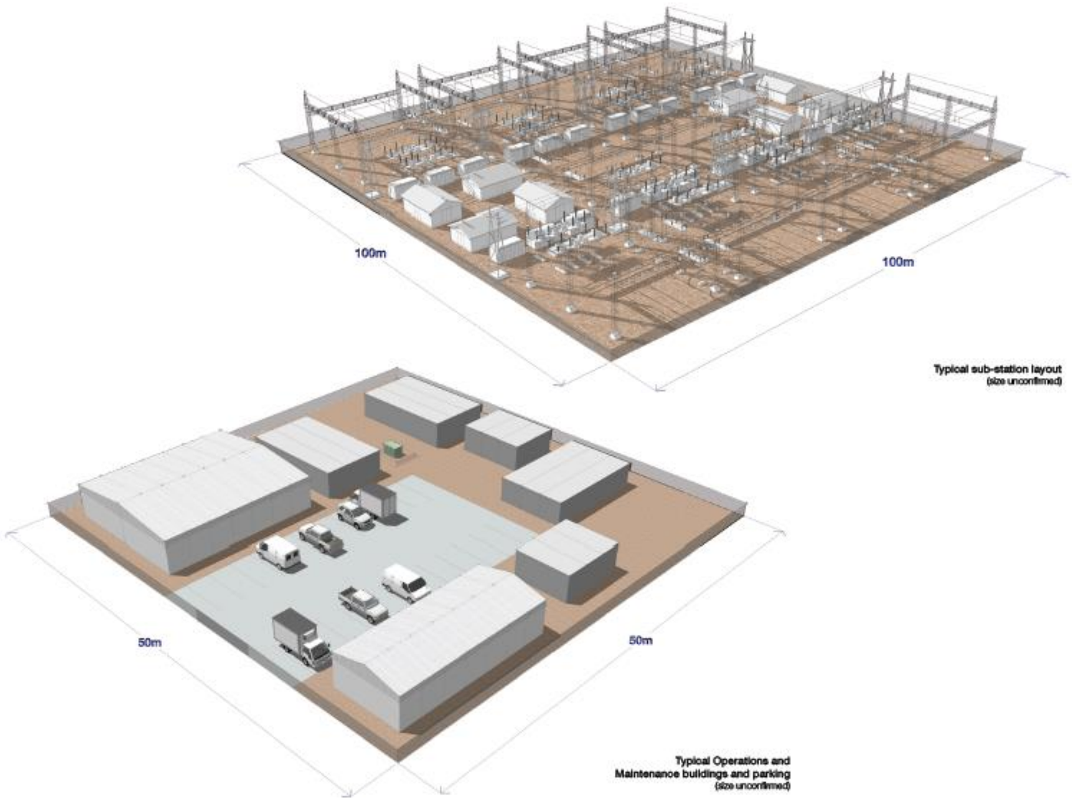

Plate 2 Typical Substation Layout

1.5.5 Access

The turbine locations will be accessed through a network of unsealed tracks which will be established across the project site. These access tracks will be up to 9 m wide during construction, depending on local topography, but will be reduced to between 4 m and 6 m during operation. Such roads are required to facilitate access for the cranes and abnormal load deliveries of turbine components.

Existing farm access tracks will be upgraded and utilised where possible, as will existing watercourse crossings. No borrow pits will be established on site. All material required for the construction of the proposed project will be imported to site.

1.5.6 Compound

There will also be an on-site office compound, including site offices, parking and an operation and maintenance facility including a control room.

1.5.7 Ancillary Equipment

In addition to the key components outlined above, the WEF will also require:

- Anemometer masts;
- Security fencing; and
- CCTV monitoring towers.

2 LEGAL FRAMEWORK

An application for Environmental Authorisation, in term of the National Environmental Management Act, Act 107, 1998 (NEMA), Environmental Impact Assessment Regulations, 2010, was submitted to the Department of Environmental Affairs in April 2014. This section of the draft EMPr will need to be updated to include the recommendations and requirements that are outlined in the Environmental Authorisation, should this project be authorised by the DEA.

Table 2:1: The NEMA EIA Regulations Listed Activities Applicable to the Proposed WEF

2010 NEMA EIA Regulations			**2014 NEMA EIA Regulations**		
#	**Description of Listed Activities**	**Triggered**	**#**	**Description of Listed Activities**	**Triggered**
GN R.544 10 (i)	The construction of facilities or infrastructure for the transmission and distribution of electricity – (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kV.	**NO** 33 kV electrical reticulation will be installed to transfer the electricity from the turbines to the 33/132 kV on-site substation. The powerlines will be installed underground where possible.	GN R.983 11 (i)	The construction of facilities or infrastructure for the transmission and distribution of electricity – (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kV.	**NO** 33 kV electrical reticulation will be installed to transfer the electricity from the turbines to the 33/132 kV on-site substation. The powerlines will be installed underground where possible.
GN R.544 11 (iii) (x) and (xi)	The construction of: (iii) bridges; (x) buildings exceeding 50 m² in size; or (xi) infrastructure or structures covering 50 m² or more; where such construction occurs within a watercourse or within 32 m of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	**YES** The internal roads will include a minimum of eight water crossings, some of which may require bridges to be constructed within a watercourse. The footprint of the turbines and associated infrastructure will exceed 50 m², *but a 32 m buffer around all watercourses has been applied for buildings and infrastructure.*	GN R.983 12 (iii) (x) and (xi)	The construction of- (iii) bridges exceeding 100 square meters in size; (x) buildings exceeding 100 square meters in size; (xii) infrastructure or structures with a physical footprint of 100 square meters or more; where such development occurs – (a) within a watercourse; or (c) if no developments setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.	**YES** The internal roads include a minimum of eight water crossings, some of which may require bridges to be constructed within a watercourse. Some of these may exceed 100 m². The footprint of the turbines and associated infrastructure will exceed 50 m², *but a 32 m buffer around all watercourses has been applied for buildings and infrastructure.*
GN R.544 13	The construction of facilities or 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 but not exceeding 500 m³.	**NO** Fuel and transformer oil will be stored on site during construction and operation, however the combined capacity will not exceed 80 m³.	GN R.983 14	The construction of facilities or 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	**NO** Fuel and transformer oil will be stored on site during construction and operation, however the combined capacity will not exceed 80 m³.

				metres but not exceeding 500 cubic metres.	
GN R.544 18 (i)	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from - (i) a watercourse	**YES** New bridges may need to be constructed or expanded for the construction phase of the WEF, the result of which would mean that there may be removal or moving of soil, sand, pebbles or rock of more than 5 cubic metres from - (i) a watercourse	GN R.983 19	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from - (i) a watercourse	**YES** New bridges may need to be constructed or expanded for the construction phase of the WEF, the result of which would mean that there may be removal or moving of soil, sand, pebbles or rock of more than 5 cubic metres from - (i) a watercourse
GN R.544 23 (ii)	The transformation of undeveloped, vacant or derelict land to – (ii) residential, retail, commercial, recreational, industrial or institutional use, outside an urban area and where the total area to be transformed is bigger than 1 hectare but less than 20 hectares;	**NO** The project is located on currently undeveloped land. The combined footprint of the turbines, laydown areas, road and electrical reticulation, on-site office and substation will be more than 20 hectares.	GN R983 27	The clearance of an area of 1 hectares or more but less than 20 hectares of indigenous vegetation, except where such clearance is required for (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	**NO** The project is located on currently undeveloped land. The combined footprint of the turbines, laydown areas, on-site office and substation will be more than 20 hectares.
GN R.544 24	The transformation of land bigger than 1000 m² in size, to residential, retail, commercial, industrial or institutional use, where, at the time of the coming into effect of this Schedule or thereafter such land was zoned open space, conservation or had an equivalent zoning.	**NO** There is no land zoned as open space, conservation or equivalent within the proposed development site.	GN R983 28 (ii)	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 01 April 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.	**YES** The majority of the proposed development site is currently used for agriculture, lies outside an urban area and the land to be developed will be bigger than 1 hectare.
GN R.544 26	Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	**POSSIBLY** At present this section of the NEMBA is not yet defined so it does not apply at this time.	GN R.983 30	Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	**POSSIBLY**

GN R.544 27 (ii)	The decommissioning of existing facilities or infrastructure, for – (ii) electricity transmission and distribution with a threshold of more than 132kV.	**NO** No existing facilities or infrastructure for electricity transmission or distribution will be decommissioned.	GN R.983 (i), (ii) (iii), (iv) and (v)	The decommissioning of existing facilities, structures or infrastructure for (i) any development and related operation activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014; (ii) any expansion and related operation activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014; (iii) any development and related operation activity or activities and expansion and related operation activity or activities listed in this Notice or Listing Notice 3 of 2014; or (v) any activity regardless the time the activity was commenced with, where such activity: (a) is similarly listed to an activity in (i), (ii), (iii), or (iv) above; and (b) is still in operation or development is still in progress	**NO** No existing facilities, structures or infrastructure will be decommissioned.
GN R.544 38	The expansion of facilities for the transmission and distribution of electricity where the expanded capacity will exceed 275 kilovolts and the development footprint will increase.	**NO** An expansion of transmission capacity at Gamma Substation will be required at the tie in to the national grid but the development footprint will not increase.	GN R.983 47	The expansion of facilities for the transmission and distribution of electricity where the expanded capacity will exceed 275 kilovolts and the development footprint will increase.	**NO**
GN R.544 39 (iii)	The expansion of (iii) bridges; within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, where such expansion will result in an increased development footprint.	**YES** The internal roads will include a minimum of eight water crossings, some of which may require existing farm bridges to be expanded.	GN R.983 48 (iii)	The expansion of (iii) bridges where the bridge is expanded by 100 square meters or more in size; where such development occurs – (a) within a watercourse; (b) in front of a development setback; or (c) if	**YES** The internal roads include a minimum of eight water crossings, some of which may require existing farm bridges to be expanded. Some of these may exceed 100 m^2.

				no developments setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.	
GN R.544 47 (i) and (ii)	The widening of a road by more than 6 m, or the lengthening of a road by more than 1 km – (i) where the existing reserve is wider than 13,5 m; or (ii) where no reserve exists, where the existing road is wider than 8 m.	**Yes** Where roads are present and may require widening for access reasons during construction this clause may be applicable. However, it is unlikely that any large roads will be affected.	GN R.983 56 (i) and (ii)	The widening of a road by more than 6 m, or the lengthening of a road by more than 1 kilometre – (i) where the existing reserve is wider than 13.,5 metres; or (ii) where no reserve exists, where the existing road is wider than 8 metres.	**Yes**
GN R.545 1	The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 MW or more.	**YES** Construction of a wind energy facility up to 147 MW in installed capacity. The facility will be comprised of individual, spatially separated, turbines with an individual generating capacity of 1.5 – 4.5 MW each.	GN R.984 1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more.	**YES**
GN R.545.15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 Ha or more.	**YES** The project is located on currently undeveloped land the combined footprint of the turbines, laydown areas, internal roads and substation will exceed 20 hectares.	GN R.984 15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance plan.	**YES**
GN R.546 4	The construction of a road wider than 4 m with a reserve less than 13.5 m (d) In Western Cape: (ii) All areas outside urban areas;	**YES** Access tracks will be required between the turbines and other infrastructure onsite. These will be unsealed and up to 9 m wide	GN R.985 4	The development of a road wider than 4 metres with a reserve less than 13.5 metres. (f) in Western Cape: (i) areas	**YES** Access tracks will be required between the turbines and other infrastructure onsite. These will be unsealed and up to 9 m wide

		during construction, but will be reduced to max. 6 m width during operation. The proposed site falls outside of urban areas.		outside urban areas; (aa) areas containing indigenous vegetation	during construction, but will be reduced to max. 6 m width during operation. The proposed site falls outside of urban areas and contains indigenous vegetation.
GN R.546 10	The construction 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 m³ (e) In Western Cape: (ii) All areas outside urban areas;	**NO** Storage of fuel on the site will be required however the volume of this storage is will be below 30 m^2.	GN R.985 10	The development 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.	**NO**
GN R.546 12 (b)	The clearance of an area of 300 m^2 or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation. (b) Within critical biodiversity areas identified in bioregional plans	**NO** Critical Biodiversity Areas (CBAs) were identified during the EIA process and considered in the layout of the proposed development, so that no roads or turbines will fall within a CBD. Some of the proposed turbine positions are on the border of a CBA, however any clearance of vegetation required surrounding these will not exceed 300 m^2	GN R.984 12 (a) (ii)	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. (a) In Western Cape province*:* (ii) Within critical biodiversity areas identified in bioregional plans	**NO**
GN R.546. 13 (a) (b) (c) (bb) (cc)	The clearance of an area of 1 Ha or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation (a) Critical biodiversity areas and ecological support areas as identified in systematic biodiversity plans adopted by the competent authority (b) National	**NO** Clearing of vegetation within a CBA will not exceed 1 Ha. The study area covers a small portion that falls within the Karoo Escarpment Grassland (NPAESFA) of the Western Cape Province,	GN R.984 15 (c) (i)	The transformation of land bigger than 1000 square metres in size, to residential, retail, commercial, industrial or institutional use, where, such land was zoned open space, conservation or had an equivalent zoning, on or after 02 August 2010 (c) in Western Cape: (i) Outside urban areas	**NO** The proposed development site does not include any land zoned as open space, conservation or equivalent.

	Protected Area Expansion Strategy Focus Areas (NPAESFA) (c) In the Northern Cape and Western Cape: ii. Outside urban areas, in (bb) National Protected Area Expansion Strategy Focus Areas (NPAESFA); (cc) Sensitive areas as identified in an environmental management framework as contemplated in Chapter 5 of the Act and as adopted by the competent authority	however clearing of vegetation within this will not exceed 1 Ha.			
GN R.546 14 (a) (i)	The clearance of an area of 5 Ha or more of vegetation where 75% or more of the vegetative cover constitutes indigenous Vegetation….(a) In Western Cape: (i) All areas outside urban areas.	**YES** Clearance of vegetation will be required for construction of the turbine foundations, hardstands, substation and road network in areas with 75 % or more of indigenous vegetation and this will exceed 5 ha.			
GN R.546 16	The construction of: (iii) buildings with a footprint exceeding 10 m² in size; or (iv) infrastructure covering 10 m² or more; where such construction occurs within a watercourse or within 32 m of a watercourse, measured from the edge of a watercourse; (d) In the Western Cape: (ii) Outside urban areas, in: (bb) National Protected Area Expansion Strategy Focus Areas (NPAESFA).	**NO** A 32m buffer was applied to all watercourses during the design phase as embedded mitigation, so that no construction of buildings or infrastructure will take place within this buffer.	GN R.984 14 (iii) (x) and (xi) (a) and (c) (f) (i) (bb) and (ff)	The development of (iii) bridges exceeding 10 square meters in size; (x) buildings exceeding 10 square metres in size and (xi) infrastructure or structures with a physical footprint of 10 square metres or more; Where such development occurs – (a) within a watercourse and (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse.	**YES** Bridges may need to be constructed over watercourses exceeding 10 m² in size. The development site area covers a small portion that falls within the Karoo Escarpment Grassland (NPAESFA) of the Western Cape Province, no development will occur in this area. No required water crossings fall within a Critical Biodiversity Area.

				(f) In Western Cape: (i) outside urban areas, in: (bb) National Protected Area Expansion Strategy Focus (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans	
GN. R.546 19	The widening of a road by more than 4 m, or the lengthening of a road by more than 1 km (d) In the Western Cape: (ii) All areas outside urban areas	**YES** Where existing tracks/roads exist within the site these maybe widened or lengthened to facilitate the access tracks of 4-9m which will be used to access the turbines. These access tracks will be up to 9 m wide during construction, but will be reduced to 4-6 m during operation.	GN R.984 18 (a)	The widening of a road by more than 4 metres; or the lengthening of a road by more than 1 kilometre (f) In Western Cape: (i) All areas outside urban areas: (aa) Areas containing indigenous vegetation	**YES**

3 ENVIRONMENTAL IMPACT ASSESSMENT

The EMPr has been developed based on the findings and recommendations of the EIA (Arcus, 2015).

3.1 Summary of Findings

During the EIA process, impacts on both the biophysical and socio-economic environments were assessed. The following specialist's studies were commissioned based on the sensitivities of the site and the potential impacts of the proposed development:

- Visual;
- Terrestrial Ecology (Flora and Fauna);
- Bats;
- Wetlands and Freshwater;
- Birds;
- Soils, Land Use and Agricultural Potential;
- Heritage and Palaeontology;
- Noise; and
- Socio-Economic.

From the assessment, it is evident that the construction and the operation of the WEF and grid connections will have negative impacts both socially and environmentally but when appropriate mitigation measures applied negative impacts are outweighed by positive impacts. Overall the project has a positive economic impact regionally and for South Africa as a whole as power generated from the WEF will feed into the National Eskom grid, create job opportunities, and contribute to the local and regional economy

3.2 Assessment of Alternatives

Different alternatives ranging from site location, transportation, design, turbine technologies, and the No Development alternative have all been considered for the proposed WEF. When considering the alternatives the applicant needs to consider environmental, social and economic factors and technical factors. Considering the above mentioned factors, EWFP intends to use the best available technology to satisfy these factors.

The preferred site was chosen based on the following: because the site is located within an area that has a good wind resource, the four components of the proposed development have been located in the sections of the site that are of low-medium areas of ecological sensitivity. The No Development alternative was identified as a high negative social cost to South Africa in terms of the country meeting its energy needs with clean, renewable energy, and a medium negative social cost in terms lost employment and business opportunities, and the benefits associated with the establishment of a Community Trust.

The No Development scenario is that the Umsinde Emoyeni WEF: Phase 1 cannot be constructed. This result will include the following:

- The land-use remains agricultural with no further benefits derived from the implementation of a complementary land use;
- There is no change in the current landscape or environmental baseline;
- Whilst no WEF development will occur on site, other wind energy projects go ahead as planned for other areas locally;
- No additional electricity will be generated onsite or supplied through means of renewable energy resources. This would have implications for the South African Government in achieving its proposed renewable energy target;

- There is no opportunity for additional employment (albeit temporary) in the local area where job creation is identified as a key priority; and
- The local Economic Development benefits associated with the WEF development's REIPPPP commitments will not be realised.

The No Development alternative was not considered feasible in the context of the proposed development and the needed power that will be generated from this renewable resource.

3.3 Summary of the Impact Assessment

Potential environmental impacts were evaluated according to their extent, duration, intensity and magnitude. Negative impacts of the proposed project on the biophysical environment include clearing of vegetation that leads to habitat fragmentation, potential loss of species of concern, soil erosion, surface water pollution; while social-economic impacts being minimal loss of agricultural land, disruption of social relations within the proposed area by the introduction of contractor workers from different areas, spread of diseases, loss of potential heritage resources and impact on sense of place.

All impacts have been identified and assessed at different stages (design/planning, construction, operation and decommission) and possible mitigation measures assigned to ensure low significance (for negative impacts) or high significance (for positive impacts).

4 ENVIRONMENTAL MANAGEMENT PROGRAMME

This section forms the core of the EMPr and outlines the specific mitigation measures for those key impacts identified in the section above.

4.1 Environmental Awareness and Compliance

The philosophy that has been used for the compilation of this management programme is derived from the principles of the National Environmental Management Act (No. 107 of 1998) which states that development must be socially, economically and environmentally sustainable. Sustainable development requires that:

- The disturbance of ecosystems and loss of biodiversity are avoided (minimised or remedied);
- Pollution and degradation of the environment are avoided or minimised and remedied; Waste is avoided or minimised and re-used or re-cycled where possible and otherwise disposed of in a responsible manner;
- A risk averse and cautious approach is applied;
- Negative impacts on the environment and on people's environmental rights be anticipated; and, prevented and where they cannot altogether be prevented, are minimised and remedied.

The Act makes provision that anyone who causes pollution or degradation of the environment is responsible for preventing impacts occurring, continuing or recurring and for the costs of repair of the environment.

4.2 Roles and Responsibilities for Good Environmental Management

The developer, together with the each appointed contractor will be responsible for environmental management on site during the construction and operational phases of the proposed development. Specific roles and responsibilities are highlighted in the table below.

Developer Representative – Environmental Manager

- Review and approve EMPr prior to authorisation by DEA.

- Review and approve any EMPr updates or amendments.
- Ensure environmental requirements are integrated into the project plans, method statements and tender processes.
- Support the site environmental control officer during the construction phase, to ensure implementation of the EMPr.
- Follow up and close out all environmental incidents and non-conformances.
- Appointment a suitably qualified independent environmental control officer during the construction phase.

Principal Contractor Representative - Environmental Control Officer

An independent environmental consultant will arrange for inspections of the construction activities and EMPr implementation throughout the construction phase. After each inspection, the ECO will produce a monitoring report that will be submitted to the client DEA and Western Cape Environmental Department (DEADP). Relevant sections of the minutes of customary (monthly) site meetings will be attached to the monitoring report.

The Environmental Control Officer (ECO) will be responsible for overseeing the implementation of the EMP during the construction and operations phases, and for monitoring, reviewing and verifying compliance of the contractor with the EMP, record-keeping and updating of the EMP as and when necessary.

The ECO will:

- Be fully knowledgeable with the contents of the EMP;
- Be fully knowledgeable with the contents of all relevant environmental legislation and ensure compliance with them;
- Ensure that the contents of the EMP are communicated to the contractor, all site staff, and the the contractor and /or site manager are made aware of the contents of the EMP, through presentations and discussions;
- Ensure that compliance to the EMP is monitored by regular and comprehensive inspection of the site and surrounding areas;
- Report on any incidents of non-compliance and ensure mitigation measure are implemented as soon as practical.

During *construction*, the Environmental Control Officer will be responsible for the following:

- Meeting on site with the Construction Manager prior to the commencement of construction activities to confirm the construction procedure and designated activity zones;
- Daily / weekly (depending on the extent of construction activities, at any given time) monitoring of site activities during construction to ensure adherence to the specifications contained in the EMP, using a monitoring checklist that is to be prepared by an independent environmental assessment practitioner at the start of the construction phase;
- Preparation of the monitoring report based on the site visit;
- Conducting an environmental inspection on completion of the construction period and signing off the construction process with the Construction Manager; and
- Maintain an Incidents Register and Complaints Register on site.

During *operation*, the Environmental Control Officer will be responsible for:

- Overseeing the implementation of the EMP for the operation phase;
- Ensure that the necessary environmental monitoring takes place as specified in the EMP;

- Update the EMP and ensure that records are kept of all monitoring activities and results; and
- Maintain an Incidents Register and Complaints Register on site.

During *decommissioning*, the Environmental Control Officer will be responsible for:

- Overseeing the implementation of the EMP for the decommissioning phase; and
- Conducting an environmental inspection on completion of decommissioning and "signing off" the site rehabilitation process.

4.3 Training and Induction of Employees

The contractor has a responsibility to ensure that all personnel involved in the project are aware of and are familiar with the environmental requirements for the project. The EMP shall be part of the terms of reference (ToR) for all contractors, sub-contractors and suppliers. All Contractors have to give some assurance that they understand the EMP and that they will undertake to comply with the conditions therein. All senior and supervisory staff members shall familiarise themselves with the full contents of the EMP. They shall know and understand the specifications of the EMP and be able to assist other staff members in matters relating to the EMP.

The Contractor must ensure that all staff working on site has an environmental induction. The presentation can include the following topics;

- What is meant by "Environment"?
- Why the environment needs to be protected and conserved.
- How construction activities can impact on the environment.
- What can be done to militate against such impacts?
- Awareness of emergency and spills response provisions.
- Social responsibility during construction e.g. being considerate to local residents.

A detailed environmental management and training program must be developed. The purpose of this is to ensure that all staff and workers understand what is required of them. The main components of the program can incorporate the following:

- Concept of sustainability and the reasons for good environmental management and practice
- Potential environmental impacts
- Mitigation measures
- Establishing a chain of responsibility and decision making
- Specific training requirements of certain staff, and the potential hazardous associated with the job.
- Methodologies to be used for field sampling
- Training in the use of field equipment
- Training in identification of non-compliance situations and procedures to be followed in such instances
- Reporting requirements
- Fire management
- HIV/AIDS

4.4 Complaints Register and Environmental Incidents Book

The Contractor must record any complaints received from the community. The complaint must be brought to the attention of the site manager and Environmental Control Officer, who will respond accordingly.

The following information will be recorded:

- Time, date and nature of the complaint;

- Response and investigation undertaken; and,
- Actions taken and by whom.

All complaints received will be investigated and a response (even if pending further investigation) will be given to the complainant within 7 days.

All environmental incidents occurring on the site will be recorded. The following information will be provided:

- Time, date, location and nature of the incident,
- Actions taken and by whom.

4.5 Construction Environmental Monitoring

Environmental audits must be undertaken by an independent environmental consultant who will act as the Environmental Control Officer twice monthly, and on a daily basis or what is deemed necessary by the ECO during times of heavy earth works and vegetation clearing, in order to ensure compliance of all aspects of the EMP.

In order to facilitate communication between the ECO and the Resident Engineer and Contractor, it is vital that a suitable chain of command is structured that will ensure that the ECO's recommendations have the full backing of the project team before being conveyed to the Contractor. In this way, penalties as a result of non-compliances with the EMP may be justified as failure to comply with instruction from the highest authority.

4.6 Dealing with Non Compliance with the EMP

There may be difficulties encountered with carrying out the mitigation measures within the EMPr, this may result in non-compliance with the EMP. It may be possible that the contractor and or the developer in place procedures to motivate staff members to comply with the EMPr and to deal with deal with non-compliance. The developer must make this known to the contractor at the earliest stage possible, even during the tender phase.

4.7 EMP Amendments and Instructions

No EMP amendments shall be allowed with the approval of the DEA. Amendments may be possible, following discussions with the relevant ECO or environmental consultant, who may propose EMP amendments on behalf of the developer or issue EMP instructions, either corrective actions, remediation or rehabilitation. These correction action must be completed within the specified timeframes.

5 DESIGN PHASE / PRE–CONSTRUCTION PHASE MITIGATION MEASURES

The objectives of the pre-construction phase are:

- To promote environmental awareness.
- To define roles and responsibilities for environmental management;
- To ensure suitable environmental training and induction to all contractors, sub-contractors and labourers; and
- To ensure that all legal obligations and contractual conditions have been met prior to commencing of construction.

Mitigation measures for Legal Compliance.

- Appoint an independent environmental control officer
- Appoint an internal environmental co-ordinator or environmental officer, to oversee day to day environmental activities.

- Staff should be educated as to the need to refrain from indiscriminate waste disposal and/or pollution of local soil and water resources and receive the necessary safety training.
- Before construction begins, all areas to be developed must be clearly demarcated with fencing, by a qualified surveyor.
- The contractor must ensure compliance with conditions described in the environmental authorisation.
- No construction camps are allowed on site. No workers are allowed to stay overnight in the construction area.
- Confirm with ECO, suitable sites for the construction camps (equipment and batching etc.) and storage areas for materials. All construction equipment must be stored within this construction camp and all associated oil changes etc. (no servicing) must take place within this camp.
- Unskilled labourers should be drawn from the local market.
- Training of site staff.
- Environmental awareness training for construction staff, concerning the prevention of accidental spillage of hazardous chemicals and oil; pollution of water resources (both surface and groundwater), air pollution and litter control and identification of archaeological artefacts.
- Project Manager shall ensure that the training and capabilities of the Contractor's site staff are adequate to carry out the designated tasks.
- Staff operating equipment (such as excavators, loaders, etc.) shall be adequately trained and sensitised to any potential hazards associated with their tasks.
- No operator shall be permitted to operate critical items of mechanical equipment without having been trained by the Contractor and certified competent by the Project Manager.

The developer must ensure that the following mitigation measures are applied to the proposed project prior to the construction phase. These measures must be included in an updated EMPr to be submitted to the DEA for approval.

Prior to the submission of the final layout plan to the DEA for approval, the following specialists must visit the site to assist with the micro-siting the layout and do a walkthrough of all power lines:

- Flora and fauna specialists
- Avifaunal specialist
- Palaeontologist

Following the selection of turbine to be used for the project, the developer must update the layout plan for Phase 1, this together with the following management plans, to be developed, must be submitted to the DEA for approval:

- Traffic Management Plan – this plan will include the necessary arrangements to transport all equipment and infrastructure to site, including the necessary road transport permits.
- Construction Site Traffic Management Plan – this will be in the form of a site layout, showing the flow of traffic during the construction phase taking into consideration existing land users.
- Storm water Management Plan – once the final layout plan has been produced the appointed responsible engineers must produce a storm water management plan for the site, during the construction and operational phases of the project.
- A health and safety plan must be drawn up to ensure worker safety.

The construction of the WEF will result in water crossings for the expansion of existing and / the construction of new bridges over water courses. The developer must ensure that Water Use Licences are applied for and approved, prior to the start of construction. All mitigation measures proposed in the water use licence must be adhered to and included in an updated EMPr and submitted to the DEA for approval.

Develop a Project Layout and Access Plan to show the intended use of the area. The plan shall clearly indicate and/or describe the location and details of:

- Servitudes.
- Areas and routes to be cleared – including the size / width of the cleared areas.
- The construction campsite and rest areas to be used during construction.
- Waste disposal sites to be used during construction.
- Sources of construction materials.
- Power supply during construction.
- Existing roads and tracks to be used as transportation routes, and routes to gain access to construction areas.
- New tracks deemed necessary to provide access to construction activities.
- Any informal residential structures found within the property.
- Affected land use, 1:50 year floodlines.
- Sensitive areas.

5.1 Method Statements

Prior to construction the developer must ensure that the contractor supply the following method statements:

- Vegetation clearing;
- Cement mixing;
- Hazardous waste management;
- Emergency preparedness and response;
- Hazardous spills clean up;
- Topsoil stockpiling management;
- Laydown area management;
- Hazardous materials management;

5.2 Site Establishment

The object of site establishment is to ensure that an appropriate site is selected for the construction camp/site office and that the site office is managed in an environmentally responsible manner with minimal impact on the environment.

Mitigation Measures

Before establishing the construction office areas, carefully plan the layout and develop a Construction Site Office Plan[2]. The Construction Site Office Plan shall provide a description of the site and shall show, on a reasonably scaled map, the intended use of the site. Indicate and/or describe the location, size / quantity / capacity and design of:

- Access routes;
- Ablution facilities (including details on the handling of sewage and wastewater);
- On-site waste management facilities (waste containers, etc.);
- Design of bunds and other structures for containment of hazardous substances;
- Fencing;
- Water storage and supply;
- Power supply (for cooking, space heating, lighting, etc.);

[2] To form part of the Project Layout and Access Plan.

- Fire extinguishers, first aid kit and any other relevant safety equipment;
- Other structures and buildings (offices, storerooms, workshops, etc.);
- Other storage areas and stockpiles (i.e. topsoil, construction materials, equipment, etc.);

Location of areas to be reinstated upon completion of the construction period, providing measures to be used for reinstatement.

- An area within the site must be demarcated for a construction site office, which will include storage area. This area must be fenced off.
- Site establishment shall take place in an orderly manner and all required amenities shall be installed at the lay down area before the main workforce move onto site.
- The construction camp shall have the necessary ablution facilities with chemical toilets at commencement of construction.
- The Contractor shall inform all site staff to make use of supplied ablution facilities and under no circumstances shall indiscriminate sanitary activities be allowed other than in supplied facilities.
- The Contractor shall supply waste collection bins and all solid waste collected shall be disposed of at a registered landfill.
- Potable water for use by on site workers must be made available on a daily basis at the site office and the working areas on site.
- A certificate of disposal shall be obtained by the Contractor and kept on file. Where a registered waste site is not available close to the construction site, the Contractor shall provide a method statement with regard to waste management.
- The disposal of waste shall be in accordance with all relevant legislation. Under no circumstances may solid waste be burnt or buried on site.

Siting, Establishing and Management of Storage Material and Facilities

- Choice of location for storage areas must take into account prevailing winds, distances to water bodies, general onsite topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary.
- Storage areas must be designated, demarcated and fenced.
- Storage areas should be secure so as to minimize the risk of crime. They should also be safe from access by children / animals etc.
- Fire prevention facilities must be present at all storage facilities.
- Proper storage facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater regime around the temporary storage area(s).
- These pollution prevention measures for storage should include a bund wall high enough to contain at least 110% of any stored volume, and this should be sited away from drainage lines in a site with the approval of the Engineer.
- Any water that collects in the bund must not be allowed to stand and must be removed immediately and the hydrocarbon digestion agent within must be replenished.
- All legal compliance requirements with respect to Fuel storage and dispensing must be met.
- All fuel storage tanks (temporary or permanent) and associated facilities must be designed and installed in accordance with the relevant oil industry standards, SANS codes and other relevant requirements.
- Areas for storage of fuels and other flammable materials must comply with standard fire safety regulations

- Flammable fuel and gas must be well separated from all welding workshops, assembly plants and loading bays where ignition of gas by an accidental spark may cause an explosion or fire.
- The tank must be erected at a safe distance from buildings, boundaries, welding sites and workshops and any other combustible or flammable materials.
- Symbolic safety signs depicting "No Smoking", "No Naked Flames" and "Danger" are to be prominently displayed in and around the fuel storage area.
- The capacity of the tank must be clearly displayed and the product contained within the tank clearly identified.
- There must be adequate fire-fighting equipment at the fuel storage and dispensing area or areas.
- The storage tank must be removed on completion of the construction phase of the project.
- All such tanks to be designed and constructed in accordance with a recognised code (international standard).
- The rated capacity of tanks must provide sufficient capacity to permit expansion of the product contained therein by the rise in temperature during storage.
- Only empty and externally clean tanks may be stored on the bare ground. All empty and externally dirty tanks must be sealed and stored in an area where the ground has been protected.
- Any electrical or petrol-driven pump must be equipped and positioned so as not to cause any danger of ignition of the product.
- If fuel is dispensed from 200 litre drums, the proper dispensing equipment must be used.
- The drum must not be tipped in order to dispense fuel. The dispensing mechanism of the fuel storage tank must be stored in a waterproof container when not in use.
- All waste fuel and chemical impregnated rags must be stored in leak-proof containers and disposed of at an approved hazardous waste site.
- The amounts of fuel and chemicals stored on site must be minimised.
- Storage sites must be provided with bunds to contain any spilled liquids and materials.
- These storage facilities (including any tanks) must be on an impermeable surface that is protected from the ingress of storm water from surrounding areas in order to ensure that accidental spillage does not pollute local soil or water resources.
- Clear signage must be placed at all storage areas containing hazardous substances / materials.
- Material Safety Data Sheets (MSDSs) shall be readily available on site for all chemicals and hazardous substances to be used on site. Where possible the available, MSDSs should additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes.
- Storage areas containing hazardous substances / materials must be clearly signed.
- Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures.
- A suitable Waste Disposal Contractor must be employed to remove waste oil. These wastes should only be disposed of at licensed landfill sites designed to handle hazardous wastes.
- The contractor must ensure that its staff is made aware of the health risks associated with any hazardous substances used and has been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training.
- All excess cement and concrete mixes are to be contained on the construction site prior to disposal off site.
- Any spillage, which may occur, shall be investigated and immediate action must be taken.

6 CONSTRUCTION PHASE MITIGATION MEASURES

The following sections form the core of the EMPr during the construction phase of the proposed development. The developer is to ensure that the contractor complies with all mitigation measures during the construction period. The major sources of potential impacts include, the turbine footprint construction, the construction of buildings and infrastructure, the construction of roads and bridges, and vehicle operation, and spillages.

The following is not allowed on site:

- No poaching of any animals or harvesting of any flora;
- No construction camp, for workforce accommodation is allowed on site; contractors are to ensure suitable housing for staff outside of the proposed development footprint.
- No cooking or fires allowed on site;
- No alcohol or drugs are allowed on site;

6.1 Potential Construction Phase Impacts

The following impacts are likely to occur during the construction of the proposed WEF. Specific mitigation measures for each impact is presented in the table below.

- The accidental, negligent, or deliberate spillage or inappropriate disposal of hazardous substances could result in air, soil and water pollution and may affect the health and well-being of people, plants and animals.
- Excessive noise could be made by the construction activity which would affect neighbouring communities.
- Potential damage to the soil structure, soil compaction and loss of soil fertility.
- Loss of the vegetation cover and increased erosion risks.
- Dust related problems.
- Safety hazards to the public, workers and animals in the area.
- Disturbance to local hydrology from construction activities.
- Pollution of surface water bodies
- Dust can be a nuisance to the construction workforce and to the public and can negatively affect the growth and recovery rate of plants. Potential sources of fugitive dust include, but are not limited to:
  - Demolition of concrete foundations and existing buildings;
  - Grading / movement of soil;
  - Transportation and unloading of construction materials;
  - Vehicular movement over unsurfaced roads and tracks; and,
  - Wind erosion of stockpiles.
- Construction activities will result in the exposure of the soil to erosive factors, i.e. wind and water, and the compaction of the soil in other areas;
- Illegal poaching and collection of animals and plant material.
- Loss of established indigenous and exotic habitat
- Unnecessary trampling of vegetation and harm to animals.
- Degradation of the scenic quality due to the major earthworks and any unsightly structures.
- Damage or loss of important cultural, historical or pre-historical sites and artefacts.
- Damage to existing roads and tracks, power lines, pipelines, etc.
- Dangerous conditions near road.
- Trespassing and illegal access onto land.

The table below presents a summary of the potential impacts as assessed by specialists for the construction phase of Phase 1 of the WEF.

Summary of Construction Phase Impacts

Construction Phase	Consequence	Probability	Significance	Status	Confidence
Geology, Soils and Agricultural Potential Impact					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Impact 1: Turbine footprint construction	Low	Definite	Low	- ve	High
With Mitigation	Low	Definite	LOW	- ve	High
Impact 2: Construction of buildings and infrastructure	Low	Definite	Low	- ve	High
With Mitigation	Low	Definite	LOW	- ve	High
Impact 3: Construction of roads	Low	Definite	Low	- ve	High
With Mitigation	Low	Definite	LOW	- ve	High
Impact 4: Vehicle operation and spillages	Very Low	Definite	Low	- ve	High
With Mitigation	Very Low	Improbable	Insignificant	- ve	High
Impact 5: Dust generation	Low	Definite	Low	- ve	High
With Mitigation	Very Low	Improbable	Insignificant	- ve	High
Terrestrial Ecological Impacts					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Impacts on vegetation and listed or protected plant species resulting from construction activities	High	Probable	High	Negative	High
After Mitigation:	Medium	Probable	Medium	Negative	High
Alien Plant Invasion Risk	Medium	Probable	Medium	Negative	High
After Mitigation:	Very Low	Probable	Low	Negative	High
Increased Erosion Risk	Medium	Probable	Medium	Negative	High
After Mitigation:	Very Low	Probable	Very Low	Negative	High
Direct faunal impacts during construction	Medium	Probable	Medium	Negative	High
After Mitigation:	Low	Probable	Low	Negative	High
Bats					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Impact 1: Roost disturbance and/or destruction due to wind turbine, O&M building and sub-station construction	Medium	Probable	Medium	Negative	High
With Mitigation:	Very Low	Possible	Insignificant	Negative	High
Impact 2: Disturbance to and displacement from	Medium	Definite	Medium	Negative	High

Construction Phase	Consequence	Probability	Significance	Status	Confidence
foraging habitat due to wind turbine, O&M building and sub-station construction					
With Mitigation:	Low	Definite	Low	Negative	High
Birds					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Habitat Destruction	Medium	Definite	Medium	Negative	High
With Mitigation:	Low	Definite	Low	Negative	High
Disturbance and Displacement	Low	Definite	Low	Negative	High
With Mitigation:	Very low	Definite	Very low	Negative	High
Heritage					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Palaeontology	Medium-high	Probable	Med - High	Negative	Medium
With Mitigation:	Medium	Probable	Medium	Positive and Negative	Medium
Pre-colonial heritage	Medium	Probable	Medium	Negative	High
With Mitigation:	Low	Improbable	V low	Neutral	High
Landscape/setting	Medium	Likely	Medium	Negative	High
With Mitigation:	Medium	Likely	Medium	Negative	High
Impact Assessments that changed after updated 35 Turbine Layout					
Colonial heritage at 98 Turbine Layout	Medium	***Probable***	Medium	Negative	High
With Mitigation at 98 Turbine Layout:	Medium	Probable	Medium	Positive	High
Colonial heritage	Medium	**Possible**	Medium	Negative	High
With Mitigation:	Medium	Probable	Medium	Positive	High
Palaeontological Heritage Impact					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Disturbance, damage or destruction of well-preserved fossils at or beneath the ground surface during the construction phase (especially due to bedrock excavations, ground clearance)	High	Possible	Medium	Negative	Medium
With Mitigation	Medium	Possible	Low	Positive and Negative	Medium
Noise					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Construction Noise	Low	Improbable	Very Low	Negative	High

Construction Phase	Consequence	Probability	Significance	Status	Confidence
Visual					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Construction of Turbines	Low	Probable	Low	Negative	Medium
With Mitigation:	Low	Probable	Low	Negative	Medium
Wetlands and freshwater					
Loss of riparian systems and water course		High	Medium	Negative	High
With Mitigation:		High	Low	Negative	High
Impact on riparian systems through the possible increase in surface water runoff from hard surfaces and or roads on riparian form and function		High	Medium	Negative	High
With Mitigation:		High	Low	Negative	High
Increase in sedimentation and erosion within the development footprint		High	Medium	Negative	High
With Mitigation:		High	Low	Negative	High
Impact on localized surface water quality		High	Medium	Negative	High
With Mitigation:		High	Low	Negative	High
Social Impacts					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Benefits associated with providing technical advice to local farmers and municipalities	Low	Probable	N/A	Negative	High
With Mitigation/Enhancement:	Low	Probable	Low (Positive)	Positive	High
Improved cell-phone coverage	Low	Probable	Low (Positive)	Positive	High
With Mitigation/Enhancement:	Low	Probable	Low (Positive)	Positive	High
Presence of construction workers and potential impacts on family structures and social networks	Medium	Probable	Medium (Negative for community as a whole)	Negative	High
With Mitigation/Enhancement:	Low	Probable	Low (Negative for a community as a whole)	Negative	High
Influx of job seekers	Low	Probable	Low (Negative)	Negative	Medium
With Mitigation/Enhancement:	Low	Probable	Low (Negative)	Negative	Medium
Safety risk, stock theft and damage to farm infrastructure associated	Low	Definite	Low (Negative)	Negative	High

Construction Phase	Consequence	Probability	Significance	Status	Confidence
with presence of construction workers					
With Mitigation/Enhancement:	Very low	Definite	Very low (Negative)	Negative	High
Increased risk of veld fires	Medium	Probable	Medium (Negative)	Negative	High
With Mitigation/Enhancement:	Low	Probable	Low (Negative)	Negative	High
Impact of heavy vehicles and construction activities	Medium	Definite	Medium (Negative)	Negative	High
With Mitigation/Enhancement:	Low	Definite	Low (Negative)	Negative	High
Loss of farmland	Low	Definite	Low (Negative)	Negative	High
With Mitigation/Enhancement:	Very low	Definite	Very Low (Negative)	Negative	High
Impact Assessments that changed after updated 35 Turbine Layout					
Creation of employment and business opportunities at 98 Turbine Layout	Low	Probable	Low (Positive)	Positive	High
With Mitigation/Enhancement at 98 Turbine Layout:	High	Probable	***High (Positive)***	Positive	High
Creation of employment and business opportunities	Low	Probable	Low (Positive)	Positive	High
With Mitigation/Enhancement:	High	Probable	**Medium (Positive)**	Positive	High

Table 6:1 Construction Phase Mitigation Measures

Mitigation Measure	Responsibility	Frequency
Route Clearing		
Off-road driving and the creation of new tracks, other than those described during Project Layout and Access Plan, are prohibited and will be regarded as unwanted tracks or unwarranted disturbed areas. All unwanted tracks or unwarranted disturbed areas shall be properly rehabilitated	Contractors engineer will be responsible for the creation of new roads. The ECO will be responsible for monitoring this activity	During site establishment Monthly thereafter.
When a new path is created: Carefully plan the route and have it clearly marked out so that drivers exactly know where to drive.	Site engineer/site manager ECO to monitor	Monthly
Establish the track by simply driving over the ground if there are no obvious obstacles (i.e. large rocks, high plants or rough terrain).	ECO to monitor Site engineer/site manager	
Keep tracks as narrow as possible and only drive on marked out routes (as per the Layout and Access Plan).		
No bulldozers will be used in bush clearing outside of the construction footprint. Only inflatable tyre earthmoving equipment must be used to reduce damage to vegetation.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
If obstacles are far enough apart, divert the track around obstacles. Only obstacles that could interfere with the safe construction and operation of the development need to be removed.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Where possible, remove obstacles by hand. Shrubs are to be cut or crushed rather than being completely uprooted in areas where landscaping or rehabilitation will be undertaken on completion of the construction. Leave vegetation in place wherever possible, especially around the perimeter of the site to provide screening and habitat. Indigenous plants can be planted to replace alien vegetation.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Only undertake earthworks in an area if it is unavoidable, and keep the size of platforms as small as possible.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.

Mitigation Measure	Responsibility	Frequency
Sensitive sites within the construction area must be demarcated to avoid accidental destruction of sensitive areas. The workforce must be made aware of these areas, and why they are sensitive.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Impacts on vegetation and listed or protected plant species resulting from construction activities		
Preconstruction walk-through of the facility in order to locate species of conservation concern that can be avoided or translocated as well as comply with the provincial permit conditions.	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Vegetation clearing to commence only after walk through has been conducted and necessary permits obtained.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
ECO to provide supervision and oversight of vegetation clearing activities within sensitive areas such as near drainage areas.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Temporary lay-down areas should be located within previously transformed areas or areas that have been identified as being of low sensitivity. These areas should be rehabilitated after use.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Alien Plant Invasion Risk		
Wherever excavation is necessary, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.

Mitigation Measure	Responsibility	Frequency
The recovery of the indigenous grass layer should be encouraged through leaving some areas intact through the construction phase to create a seed source for adjacent cleared areas.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as there are also likely to be prone to invasion problems.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Increased Erosion Risk		
Dust suppression and erosion management should be an integrated component of the construction approach.	ECO to monitor Site engineer/site manager	Weekly
Regular monitoring for erosion problems along the access roads and other cleared areas.	ECO to monitor Site engineer/site manager	Weekly
Erosion problems should be rectified on a regular basis.	ECO to monitor Site engineer/site manager	weekly
Sediment traps may be necessary to prevent erosion and soil movement if there are topsoil or other waste heaps present during the wet season	ECO to monitor Site engineer/site manager	monthly
A low cover of vegetation should be left wherever possible within the construction footprint to bind the soil, prevent erosion and promote post-disturbance recovery of an indigenous ground cover.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Disturbance near to drainage lines or the pan should be avoided and sensitive drainage areas near to the construction activities should demarcated as no-go areas.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.

Mitigation Measure	Responsibility	Frequency
Direct Faunal Impacts		
All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often persecuted out of superstition.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Any fauna threatened by the construction activities should be removed to safety by the ECO or appropriately qualified environmental officer.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises	ECO to monitor Site engineer/site manager / safety officer	During site establishment Monthly thereafter.
All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
If trenches need to be dug for water pipelines or electrical cabling, these should not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches which are standing open should have places where there are soil ramps allowing fauna to escape the trench.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Avifaunal Habitat Destruction		
Prior to construction, the avifaunal specialist must conduct a site walkthrough, covering the final road and power line routes as well as the final turbine positions, to identify any nests/breeding activity of sensitive species, as well as any additional sensitive habitats. The results of which may inform the final construction schedule, including abbreviating construction time, scheduling activities around avian breeding and/or movement of schedules, and lowering levels of associated noise.	ECO to monitor Site engineer/site manager	Prior to construction
During construction laydown areas and temporary access roads should be kept to a minimum in order to limit direct vegetation	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.

Mitigation Measure	Responsibility	Frequency
loss and habitat fragmentation, while designated no-go areas must be enforced i.e. no off road driving.		
Any clearing of stands of alien trees on site should be approved first by an avifaunal specialist.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and to this end a habitat restoration plan is to be developed by and included within the EMPr.	ECO to monitor Site engineer/site manager	Post construction
All contractors are to adhere to the EMPr and should apply good environmental practice during construction.	ECO to monitor Site engineer/site manager	Throughout construction
Avifaunal Disturbance and Displacement		
The appointed Environmental Control Officer (ECO) must be trained by the avifaunal specialist to identify the potential priority species and red data species as well as the signs that indicate possible breeding by these species. The ECO must then, during audits/site visits, make a concerted effort to look out for such breeding activities of red data species, and such efforts may include the training of construction staff (e.g. in Toolbox talks) to identify red data species, followed by regular questioning of staff as to the regular whereabouts on site of these species. If any of the red data species are confirmed to be breeding (e.g. if a nest site is found), construction activities within 1 km of the breeding site must cease, and the avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed.	ECO to monitor Site engineer/site manager	Monthly and when required.
An avifaunal specialist must conduct nest searches of all suitable cliffs and/or tree nesting sites within 1 km of the Phase 1 and Phase 2 WEFs footprints that were not surveyed as part of the pre-construction cliff surveys. This additional survey must preferably be prior to construction commencement or as soon as possible thereafter. The aim will be to locate nest sites, so that these may continue to be monitored during the construction and operation phase, along with the monitoring of already identified nest sites.	ECO to monitor Site engineer/site manager	Pre-construction, post final design

Mitigation Measure	Responsibility	Frequency
Appoint a specialist to design and conduct monitoring of the breeding of Verreaux's Eagle and Martial Eagle at all identified nest sites that are within 5 km of a turbine position. This should be done at least three times during a calendar year during construction, optimally spaced before, during and after the breeding season of large eagles. Where possible, this monitoring can be combined with the additional nest surveys described above.	ECO to monitor Site engineer/site manager	As per specialist requirements.
Bat Roost disturbance and/or destruction		
Turbine placement should only be in areas of Low-Medium and Medium bat sensitivity. No part of any turbine, including the rotor swept zone should be constructed within areas of Medium-High or High bat sensitivity.	ECO to monitor Site engineer/site manager	Design phase
Clearing of natural and agricultural areas be kept to a minimum.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Blasting activities not to occur within 2km of any known bat roosts.	ECO to monitor Site engineer/site manager	During blasting activities
Dust suppression measures to be used during the full construction phase	ECO to monitor Site engineer/site manager	Weekly
Any new roosts discovered, should be reported and incorporated into the adaptive management plan.	ECO to monitor Site engineer/site manager	Monthly and as required during construction
Roost searches to continue during construction and operational phases.	ECO to monitor Site engineer/site manager	As required by the specialist
Loss of riparian systems and water courses		
Where water course crossings are required, the engineering team must provide an effective means to minimise the potential upstream and downstream effects of sedimentation and erosion (erosion protection) as well minimise the loss of riparian vegetation (small footprint).	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
No vehicles to refuel within drainage lines/ riparian vegetation.	ECO to monitor	Weekly

Mitigation Measure	Responsibility	Frequency
	Site engineer/site manager	
During the operational phase, monitor culverts to see if erosion issues arise and if any erosion control if required.	ECO to monitor Site engineer/site manager	Monthly
Where possible culvert bases must be placed as close as possible with natural levels in mind so that these don't form additional steps / barriers.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Impact on riparian systems through the possible increase in surface water runoff from hard surfaces and or roads on riparian form and function		
Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Increase in sedimentation and erosion within the development footprint		
Any stormwater within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Impact on localized surface water quality		
Strict use and management of all hazardous materials used on site.	ECO to monitor Site engineer/site manager	Weekly
Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.).	ECO to monitor Site engineer/site manager	Weekly
Containment of all contaminated water by means of careful run-off management on the development site.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Strict control over the behaviour of construction workers.	ECO and safety to monitor Site engineer/site manager	Weekly
Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the EMPr for the project and strictly enforced.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility.	ECO to monitor Site engineer/site manager	Weekly

<table>
<tr><th>Mitigation Measure</th><th>Responsibility</th><th>Frequency</th></tr>
<tr><td colspan="3">Wind turbines Visual Impacts</td></tr>
<tr><td>Visually sensitive peaks, major ridgelines and scarp edges, including 500m buffers, to be avoided, because of silhouette effect on the skyline over large distances.</td><td>Site engineer/site manager</td><td>Design phase</td></tr>
<tr><td>Recommended Buffers
<table>
<tr><th>Landscape features/criteria</th><th>PGWC Guide-lines (2006)</th><th>Recommended visual buffer guidelines (2014)</th></tr>
<tr><td>Project area boundary</td><td>-</td><td>270m (subject to turbine specification).</td></tr>
<tr><td>Ephemeral streams/ tributaries</td><td>-</td><td>250m</td></tr>
<tr><td>Perennial rivers, wetland features</td><td>500m</td><td>500m</td></tr>
<tr><td>Major ridgelines, peaks and scarps</td><td>500m</td><td>As per visual informants map, subject to micro-siting. (500m recommended for peaks).</td></tr>
<tr><td>Local roads</td><td>500m</td><td>500m</td></tr>
<tr><td>Local district gravel roads</td><td>review if scenic</td><td>1 to 3km (can be less if outside the viewshed).</td></tr>
<tr><td>R63 arterial route</td><td>review if scenic</td><td>1 to 3km (can be less if outside the viewshed).</td></tr>
<tr><td>Farmsteads (inside the project site)</td><td>400m (noise)</td><td>800m</td></tr>
<tr><td>Farmsteads (outside the project site)</td><td>400m (noise)</td><td>2 to 4km (can be less if outside the viewshed).</td></tr>
</table>
</td><td>ECO to monitor
Site engineer/site manager</td><td>Design phase</td></tr>
</table>

Mitigation Measure	Responsibility	Frequency
Private nature reserves/ game farms/ guest farms/ resorts | 500m | 2 to 5km (can be less if outside the viewshed).		
Slopes steeper than 1:5 gradient to be avoided.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Cultural landscapes or valuable cultivated land, particularly along alluvial river terraces to be avoided.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Stream features, including 250m buffers, to be avoided.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Visual mitigation during construction		
Access and haul roads to use existing farm tracks as far as possible.	ECO to monitor Site engineer/site manager	During site establishment Weekly
Construction camp, stockpiles and lay-down area to be located out of sight of district roads, possibly in the vicinity of the proposed substation and O&M buildings.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Disturbed areas rather than pristine or intact land to preferably be used for the construction camp. Construction camp and laydown areas to be limited in area to only that which is essential	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Measures to control wastes and litter to be included in the contract specification documents.	ECO to monitor Site engineer/site manager	During site establishment Weekly thereafter.
Provision to be made for rehabilitation/ re-vegetation of areas damaged by construction activities.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Disturbance, damage or destruction of well-preserved fossils at or beneath the ground surface during the construction phase (especially due to bedrock excavations, ground clearance)		
Conduct a pre-disturbance inspection of any infrastructure that is to be positioned on sensitive geology. Sensitive specimens will need to be recorded and removed.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.

Mitigation Measure	Responsibility	Frequency
The employment of a palaeontologist during the construction phase, establishment of on-site curation facilities and identification of a repository for specimens.	ECO to monitor Site engineer/site manager	During site establishment When required during construction.
During the construction phase a chance-finds procedure should be applied should substantial fossil remains such as vertebrate bones, teeth or trackways, plant-rich fossil lenses or dense fossil burrow assemblages be exposed by excavation or discovered within the development footprint.	Environmental Control Officer should safeguard the fossils, preferably *in situ*, and alert the responsible heritage management authority (Heritage Western Cape for the Western Cape, SAHRA for the Northern Cape) so that appropriate action can be taken by a professional palaeontologist	When required during construction.
archaeological material and rock engravings		
Conduct a final walk down of roads and check turbines positions for archaeological material.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
In the improbable event of archaeological material being found, this will need to be subject to sampling and removal from site under a work plan (Heritage Western Cape) or a permit (Eastern Cape Heritage Authority)	ECO to monitor Site engineer/site manager	Throughout construction
Check dolerite clusters and flat dolerite rafts for rock engravings. Rock engravings must be assigned co-ordinates, photographed (so as to record detail) and moved out of harm's way, or the road adjusted to avoid them.	ECO to monitor Site engineer/site manager	Throughout construction
colonial period heritage		
Re-use and sensitive repair of abandoned farm houses would make a positive contribution to heritage conservation. Refurbishment should be done under the advice of a heritage architect/consultant.	ECO to monitor Site engineer/site manager	Design phase
Graves		
In the event of human bones being found on site, an archaeologist must be informed immediately and the remains removed under an emergency permit. This process will incur some expense as removal of human remains is at the cost of the developer. Time delays may result while application is made to the authorities and an archaeologist is appointed to do the work.	ECO to monitor Site engineer/site manager	Throughout construction

Mitigation Measure	Responsibility	Frequency
All identified grave yards must be mapped and co-ordinates given to the developer and the contractor. These areas must be avoided, as far a practical. The contractor is to ensure that the work force are aware of these areas, and buffers applied around them.	ECO to monitor Site engineer/site manager	Throughout construction
Employment and Business Creation Opportunities		
An accredited training and skills development programme aimed at maximising to opportunity for local workers to be employed for the low and semi-skilled positions should be initiated prior to the initiation of the construction phase. The aim of the programme should be to maximise employment opportunities for members of the local community. In this regard the programme should be aimed at community members from Murraysburg, Beaufort West, Graaff-Reinet and Richmond. The programme should be developed in consultation with the Department of Labour and the BWLM. The recommended targets are 50% and 30% of low and semi-skilled positions respectively should be taken up by local community members. Due to the low skills levels in the area, the majority of semi-skilled and skilled posts are likely to be filled by people from outside the area;	Developer/ site manager	Pre-construction and throughout construction
The recruitment selection process for the training and skills development programme should seek to promote gender equality and the employment of women wherever possible;	Developer/ site manager	Pre-construction and throughout construction
Before the construction phase commences the proponent should meet with representatives from the BWLM 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;	Developer/ site manager	Pre-construction and throughout construction
The local authorities and relevant community representatives 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.	Developer/ site manager	Pre-construction and throughout construction
Where reasonable and practical the proponent should appoint local contractors and implement a 'locals first' policy, especially	Developer/ site manager	Pre-construction and throughout construction

Mitigation Measure	Responsibility	Frequency
for semi and low-skilled job categories. Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria;		
The proponent should liaise with the BWLM 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;	Developer/ site manager	Pre-construction and throughout construction
Where possible, the proponent should assist local BBBEE companies to complete and submit the required tender forms and associated information.	Developer/ site manager	Pre-construction and throughout construction
The BWLM, 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.	Developer/ site manager	Pre-construction and throughout construction
The proponent in consultation with the contractor should hold a workshop/s with local farmers and representatives from the BWLM to discuss options for installing small-scale wind energy facilities and the technology and costs involved	Developer/ site manager	Pre-construction and throughout construction
The proponent in consultation with the contractor should investigate option of establishing a cell phone booster mast on the site.	Developer/ site manager	Pre-construction and throughout construction
impacts on family structures and social networks associated with the presence of construction workers		
An accredited training and skills development programme aimed at maximising to opportunity for local workers to be employed for the low and semi-skilled positions should be initiated prior to the initiation of the construction phase. The aim of the programme should be to maximise employment opportunities for members of the local community. In this regard the programme should be aimed at community members from Murraysburg, Beaufort West, Graaff-Reinet and Richmond. The programme	Developer/ site manager	Pre-construction and throughout construction

Mitigation Measure	Responsibility	Frequency
should be developed in consultation with the Department of Labour and the BWLM. The recommended targets are 50% and 30% of low and semi-skilled positions respectively should be taken up by local community members. Due to the low skills levels in the area, the majority of semi-skilled and skilled posts are likely to be filled by people from outside the area; The recruitment selection process for the training and skills development programme should seek to promote gender equality and the employment of women wherever possible;		
The proponent should establish a Monitoring Forum (MF) in order to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should be established before the construction phase commences, and should include key stakeholders, including representatives from the BWLM, farmers and the contractor(s). The MF should also be briefed on the potential risks to the local community and farm workers associated with construction workers;	Developer/ site manager	Pre-construction and throughout construction
The proponent and the contractor(s) should, in consultation with representatives from the MF, develop a code of conduct for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation;	Developer/ site manager	Pre-construction and throughout construction
The proponent and contractor (s) should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase;	Developer/ site manager	Pre-construction and throughout construction
The contractor should provide transport to and from the site on a daily basis for low and semi-skilled construction workers. This will enable the contractor to effectively manage and monitor the movement of construction workers on and off the site;	Developer/ site manager	Pre-construction and throughout construction
The contractors should make the necessary arrangements to transport workers from Beaufort West, Graaff-Reinet and Richmond home over weekends. This will reduce the risk posed to local family structures and social networks in Murraysburg;	Developer/ site manager	Pre-construction and throughout construction

Mitigation Measure	Responsibility	Frequency
No construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.	Developer/ site manager	Pre-construction and throughout construction
impacts on family structures, social networks and community services associated with the influx of job seekers		
The proponent should implement a "locals first" policy, specifically with regard to unskilled and low skilled opportunities;	Developer/ site manager	Pre-construction and throughout construction
The proponent should implement a policy that no employment will be available at the gate and or in Murraysburg (except for local residents).	Developer/ site manager	Pre-construction and throughout construction
risk to safety of farmers and farm workers, livestock and damage to farm infrastructure associated with the movement of construction workers on and to the site		
The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase proven to be associated with the construction activities for the WEF will be compensated for. The agreement should be signed before the construction phase commences;	Developer/ site manager	Pre-construction and throughout construction
The proponent should establish a MF (see above) that includes local farmers and develop a Code of Conduct for construction workers. This committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by the proponent and the contractors before the contractors move onto site.	Developer/ site manager	Pre-construction and throughout construction
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 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.	Developer/ site manager	Pre-construction and throughout construction
The Environmental Management Programme (EMP) should outline procedures for managing and storing waste on site,	Developer/ site manager ECO to monitor	Pre-construction and throughout construction

Mitigation Measure	**Responsibility**	**Frequency**
specifically plastic waste that poses a threat to livestock if ingested;		
The 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.	Developer/ site manager Safety officer	Pre-construction and throughout construction
The contractors appointed by the proponent must ensure that construction workers who are found guilty of trespassing, 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;	Developer/ site manager Safety officer	Pre-construction and throughout construction
The housing of construction workers on the site should be strictly limited to security personnel.	Developer/ site manager Safety officer	Pre-construction and throughout construction
The contractors appointed by the proponent should provide daily transport for low and semi-skilled workers to and from the site. This would reduce the potential risk of trespassing on the remainder of the farm and adjacent properties;	Developer/ site manager Safety officer	Pre-construction and throughout construction
Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of grass fires		
The proponent should enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase proven to be associated with the construction activities for the WEF will be compensated for. The agreement should be signed before the construction phase commences;	Developer/ site manager	Pre-construction and throughout construction
The contractor should provide adequate firefighting equipment on-site;	Site engineer/ site manager Safety officer	Pre-construction and throughout construction
Contractor should ensure that open fires on the site for cooking or heating are not allowed except in designated areas;		
The 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	Site engineer/ site manager Safety officer	Pre-construction and throughout construction

Mitigation Measure	Responsibility	Frequency
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;		
The contractor should provide fire-fighting training to selected construction staff;	Site engineer/ site manager Safety officer	Pre-construction and throughout construction
No construction staff, with the exception of security staff, to be accommodated on site over night;	Site engineer/ site manager Safety officer	Pre-construction and throughout construction
As per the conditions of the Code of Conduct, in the event of a fire proven to be 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 firefighting costs borne by farmers and local authorities.	Site engineer/ site manager Safety officer	Pre-construction and throughout construction
Potential dust and safety impacts and damage to road surfaces associated with movement of construction related traffic to and from the site		
The contractor must ensure that damage caused by construction related traffic to the gravel road between Murraysburg and Richmond, the Swaelkranz Road and the Witteklip Road and local farm roads is repaired on a regular basis throughout the construction phase. The costs associated with the repair must be borne by the contractor. Experience for other renewable energy projects is that the maintenance for roads is the responsibility of the local district roads authority. In many instances the local district roads authority lack the resources to maintain the local road network. In addition, due to legal restrictions, it is not possible for the contractor to repair damage to public roads. This can result in damage to roads not being repaired before the construction phase is completed. This is an issue that should be addressed with the local district roads authority prior to the commencement of the construction phase; As far as possible, the transport of components to the site along the N10 should be planned to avoid weekends and holiday periods;	Site engineer/ site manager Safety officer and ECO	Pre-construction and throughout construction

Mitigation Measure	Responsibility	Frequency
Sections of the roads that are located adjacent to irrigated lands or farmsteads should be watered regular basis to reduce impact of dust;		
The contractor must ensure that all construction vehicles adhere to speed limits and vehicles used to transport sand and building materials must be fitted with tarpaulins or covers;	Site engineer/ site manager Safety officer and ECO	Pre-construction and throughout construction
All workers should receive training/ briefing on the reasons for and importance of closing farm gates and driving slowly; Speed limits must be applied. Construction vehicles limit of 40 km/hr on site.	Site engineer/ site manager Safety officer and ECO	Pre-construction and throughout construction. Monthly
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.	Site engineer/ site manager Safety officer and ECO	Pre-construction and throughout construction. Monthly
The Contractor should ensure that workers are informed that no waste can be thrown out of the windows while being transported to and from the site. Workers who throw waste out windows should be fined.	Site engineer/ site manager Safety officer and ECO	Daily. Pre-construction and throughout construction
The Contractor should be required to collect waste along the road reserve on a daily basis.	Site engineer/ site manager ECO	Daily. Pre-construction and throughout construction
Waste generated during the construction phase should be transported to the registered landfill.	Site engineer/ site manager ECO	Weekly throughput construction
EMP measures (and penalties) should be implemented to ensure farm gates are closed at all times.	Site engineer/ site manager Developer to implement ECO	Daily. Pre-construction and throughout construction
EMP measures (and penalties) should be implemented to ensure speed limits are adhered to at all times.	Site engineer/ site manager Developer to implement ECO	Daily. Pre-construction and throughout construction
impact on farmland due to construction related activities		
The location of wind turbines, access roads, laydown areas etc. should be informed by the findings of key specialist studies,	Site engineer/ site manager Developer to implement	Weekly. Pre-construction and throughout construction

Mitigation Measure	Responsibility	Frequency
including the soil and botanical study. In this regard areas of high potential agricultural soils should be avoided;	ECO	
The location of wind turbines, access roads, laydown areas etc. should be discussed with the locally affected landowners in the finalisation process and inputs provided should be implemented in the layout as best as possible;	Site engineer/ site manager Developer to implement ECO	Weekly. Pre-construction and throughout construction
All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase. The rehabilitation plan should be informed by input from a botanist with experience in arid regions;	Site engineer/ site manager Developer to implement ECO	Weekly post construction
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 drawn up the Environmental Consultants appointed to undertake the EIA;	Site engineer/ site manager Developer to implement ECO	Tender phase
The implementation of the Rehabilitation Programme should be monitored by the ECO;	Site engineer/ site manager Developer to implement ECO	Weekly
All workers should receive training/ briefing on the reasons for and importance of not driving in undesignated areas;	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Monthly
EMP measures (and penalties) should be implemented to strictly limit all vehicle traffic to designated roads and construction areas. Under no circumstances should vehicles be allowed to drive into the veld;	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Daily
Disturbance footprints should be reduced to the minimum.	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Monthly
The footprint areas for the establishment of individual wind turbines should be clearly demarcated prior to commencement of construction activities. All construction related activities	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Monthly

Mitigation Measure	Responsibility	Frequency
should be confined to the demarcated area and minimised where possible;		
General Construction Mitigation Measures		
Potable toilets must be supplied to the workforce in areas of activity. One toilet per 14 workers must be implemented. Females must have separate toilets. A licenced contractor must be appointed by the contractor to provide this facility, and ensure that wastes are correctly disposed of. Servicing must take place on a weekly basis, proof of which must be retained on site by the contractor.	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Weekly
Waste skips must be provided in areas of construction activity as well as within the lay down areas, along with waste bins. Wastes must be separated into the following categories: • General waste, compactable and non-compactable • Waste paper recycling • Scrap metal • Globes and fluorescent tubes • Rubber waste • Medical waste • Chemical waste • Hazardous waste	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Weekly
Health and Safety		
Implementation of safety measures, work procedures and first aid must be implemented on site.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Weekly
Workers should be thoroughly trained in using potentially dangerous equipment	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Weekly

Mitigation Measure	Responsibility	Frequency
Contractors must ensure that all equipment is maintained in a safe operating condition.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Weekly
A safety officer must be appointed.	Developer to implement	Pre-construction
A record of health and safety incidents must be kept on site.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Weekly
Any health and safety incidents must be reported to the project manager immediately.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction.
First aid facilities must be available on site at all times.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Workers have the right to refuse work in unsafe conditions.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Daily
The contractor must ensure that all construction workers are well educated about HIV/ AIDS and the risks surrounding this disease. The location of the local clinic where more information and counselling is offered must be indicated to workers.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Material stockpiles or stacks, such as, pipes must be stable and well secured to avoid collapse and possible injury to site workers / local residents	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
An STI and HIV/AIDS awareness campaign should be launched, which is not only directed at construction workers but also at the community as a whole.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Condoms should be distributed by placing them at centrally located points and by ensuring that construction workers and community members are aware of the availability and location of	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks

Mitigation Measure	Responsibility	Frequency
condoms. The distribution of condoms should be approached with the necessary cultural sensitivity.		
Access at the construction site should be controlled to prevent sex workers from either visiting and/or loitering at the construction camp.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Daily
Ensure that the local community communicate their expectations of construction workers' behaviour with them.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Personal Protective Equipment (PPE) must be made available to all construction staff and their usage must be compulsory. Hard hats and safety shoes must be worn at all times and other PPE worn were necessary i.e. dust masks, ear plugs etc.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
No person is to enter the site without the necessary PPE.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Daily
Pre-construction, construction and operation activities should be undertaken during daylight working hours between the hours of 07:00 – 17:00 on weekdays and 07:00 – 13:00 on Saturdays. No activity will be allowed on Sundays	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
The workforce is to be provided with sufficient potable water and under no circumstances are they to use untreated water from the local watercourses for drinking.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Noise		
Construction site yards and other noisy fixed facilities should be located well away from noise sensitive areas adjacent to the development sites.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
All construction vehicles and equipment are to be kept in good repair.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks

Mitigation Measure	Responsibility	Frequency
Portable acoustic shields should be used in the case where noisy equipment is not stationary (for example drills, angle grinders, chipping hammers, poker vibrators).	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Daily
Construction staff working in areas where the 8-hour ambient noise levels exceed 75dBA should wear ear protection equipment.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Daily
Blasting operations are to be strictly controlled with regard to the size of explosive charge in order to minimise noise and air blast, and timings of explosions. The number of blasts per day should be limited, blasting should be undertaken at the same times each day and no blasting should be allowed at night.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
With regard to unavoidable very noisy construction activities in the vicinity of noise sensitive areas, the contractor and ECO should liaise with local residents on how best to minimise impact, and the local population should be kept informed of the nature and duration of intended activities.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Noise suppression measures must be applied to all construction equipment. Construction equipment must be kept in good working order and where appropriate fitted with silencers which are kept in good working order.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Should the vehicles or equipment not be in good working order, the Contractor may be instructed to remove the offending vehicle or machinery from site.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Where possible labour shall be transported to and from the site by the contractor or his Sub-Contractors by the contractors own transport.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Daily
Construction activities are to be contained to reasonable hours during the day and early evening. Night-time activities near noise sensitive areas should not be allowed.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Construction activities should be undertaken during daylight working hours between the hours of 07:00 – 17:00 on weekdays	Site engineer/ site manager Developer to implement	Pre-construction and throughout construction. Daily

Mitigation Measure	Responsibility	Frequency
and 07:00 – 13:00 on Saturdays. No activity will be allowed on Sundays.	ECO and Safety Officer	
Should any equipment, such as generators on-site, generating excessive noise, they should be fitted with appropriate noise abatement measures.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks

6.2 Post Construction

- Once construction has been completed on site and all excess material has been removed, the storage area shall be rehabilitated. If the area was badly damaged, re-seeding shall be done and fencing in of the area shall be considered if livestock/faunal species specific to the area may subsequently have access to such an area.
- Such areas shall be rehabilitated to their natural state. Any spilled concrete shall be removed and soil compacted during construction shall be ripped, levelled and re-vegetated.
- Only designated areas must be used for storage of construction materials, soil stockpiles, machinery and other equipment.
- Specific areas must be designated for cement/concrete mixing/ batching plants. Sufficient drainage for these plants must be in place to ensure that soils do not become contaminated.
- The construction camp must be kept clear of litter at all times.
- Spillages within the construction camp need to be cleaned up immediately and disposed of in the hazardous skip bin for correct disposal.
- All remaining material including building rubble and waste are to be removed from the site.
- All areas disturbed should be managed to ensure efficient drainage.
- The area designated for the deposition of spoil material is to be levelled and shaped to ensure the efficient drainage of the site. Under no circumstances is general or hazardous waste to be disposed of at this site.

6.2.1 Infrastructure

- Disassemble all temporary infrastructure units and remove components from the working areas and contractors camp. This will include storage structures and containers, water storage container, power supply, workers accommodation, sewage systems
- Drain all potable chemical toilets, being careful not to spill the contents. Transfer the waste to an appropriate disposal site.
- Drain all waste water and sewage associated with temporary ablution facilities and transfer the waste to an appropriate disposal site to be identified by the contractor.
- Disassemble all fencing around the camp and either sell, suction or donate to the local community or transfer the waste components to a disposal site or the contractor's base.
- Do not leave any components, waste or infrastructure units within the working area and camp unless specifically required for the operation and maintenance phases and as agreed by the ECO

6.2.2 Contaminated Substrate and Pollution Control Structures

- Excavate all areas of contaminated substrate, transfer the contaminated substrate to an appropriate disposal site and treat the affected areas.
- Remove all plastic linings used for pollution control and transfer to an appropriate disposal site.
- Break up all concrete structures that have been created and remove concrete waste to an appropriate disposal site.

6.2.3 Waste

- Remove all remaining construction materials from the camp and working areas and either sell, auction, donate to the local community or transfer the waste components to a disposal site or the contractor's base.

- Remove all construction debris, litter and domestic waste from the camp and working areas and transfer to an appropriate disposal site. Remove all waste receptacles from the camp and working areas and either sell, auction, donate to the local community or transfer the waste components to a disposal site or the contractor’s base.

7 OPERATIONAL PHASE MITIGATION MEASURES

Once the construction and commissioning of the WEF Phase 1 is completed the project becomes operational. The operator of the WEF has the responsibility to ensure that the mitigation measures proposed for the operational phase of the WEF is implemented and conducted appropriately. The main impacts associated with the operation phase of the WEF relate to birds and bats.

During the operation and maintenance of the WEF (including the normal operation of the turbines themselves) a certain amount of disturbance results. An operational WEF will normally have various day to day activities occurring on site, such as (but not limited to) security control, routine maintenance, road clearing/cleaning, grass/bush cutting and clearing.

These factors can all lead to birds avoiding the area for feeding or breeding, and effectively leading to habitat loss and a potential reduction in breeding success (Larsen & Madsen 2000; Percival 2005). Turbines can also be disruptive to bird flight paths, with some species altering their routes to avoid them (Dirksen *et al.* 1998, Tulp *et al.* 1999, Pettersson & Stalin 2003). While this reduces the chance of collisions it can also create a displacement or barrier effect, for example between roosting and feeding grounds and result in an increased energy expenditure and lower breeding success (Percival 2005). This could potentially occur for any waterbirds regularly utilising one of the larger dams on either side of the WEF site for foraging but roosting on the other side of the turbines (or vice versa).

Disturbance distances (the distance from wind farms up to which birds are absent or less abundant than expected) can vary between species and also within species with alternative habitat availability (Drewitt & Langston 2006). Some studies have recorded distances of 80 m, 100 m, 200 m and 300 m (Larsen & Madsen 2000, Shaffer & Buhl 2015) but distances of 600 m (Kruckenberg & Jaehne 2006) and up to 800 m have been recorded (Drewitt & Langston 2006).

Raptors are generally fairly tolerant of wind farms, and continue to use the area for foraging (Thelander *et al.* 2003, Madders & Whitfield 2006), so are not affected by displacement, which however increases their collision risk.

It is expected that some species potentially occurring on the WEF site will be susceptible to displacement, for example smaller passerines such as larks, coursers and large terrestrial red data species such as Karoo Korhaan and Ludwig’s Bustard. The extent of the impact will be local and restricted to the WEF site. As some species may not return the duration is potentially long-term.

WEFs have the potential to impact bats directly through collisions and barotrauma resulting in mortality (Horn et al. 2008; Rollins et al. 2012), and indirectly through the modification of habitats (Kunz et al. 2007b). Direct impacts pose the greatest risk to bats and, in the context of the project, habitat loss and displacement should not pose a significant risk (unless a large roost in discovered on site and bats are reluctant to leave this roost if disturbed) because the project footprint (i.e. turbines, roads and infrastructure) is small relative to the area monitored.

The developer has the responsibility to ensure that all operational mitigation measures outlined in this document, and all revisions thereof, are complied with.

7.1 Potential Operation Phase Impacts

The table below provides a summary of the potential impacts of the operation of the WEF, as assessed by specialists.

Summary of Operation Phase Impacts

Operational Phase	Consequence	Probability	Significance	Status	Confidence
Terrestrial Ecological Impacts					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Alien plant invasion risk	Medium	Definite	Medium	Negative	High
After Mitigation:	Low	Probable	Low	Negative	High
Increased erosion risk	Medium	Definite	Medium	Negative	High
After Mitigation:	Low	Probable	Low	Negative	High
Faunal impacts during operation	Medium	Probable	Medium	Negative	High
After Mitigation:	Medium	Probable	Medium	Negative	High
Bats					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Fragmentation of foraging habitat or migration routes due to the presence of the operating wind turbines and general WEF activity	High	Probably	HIGH	Negative	High
With Mitigation	Low	Probably	LOW	Negative	High
Fatalities of Medium-High and High risk bat species due to collision or barotrauma during foraging activity, attraction to turbines and during seasonal movements or migration events.	Very High	Probable	VERY HIGH	Negative	High
With Mitigation:	Medium	Possible	LOW	Negative	High
Birds					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Disturbance and Displacement	Medium	Probable	Medium	Negative	High
With Mitigation:	Low	Probable	Low	Negative	High
Power Line Collisions	High	Probable	High	Negative	High
With Mitigation:	High	Possible	Medium	Negative	High
Wind Turbine Collisions	Very High	Probable	Very high	Negative	Medium
With Mitigation:	High	Possible	Medium	Negative	Medium
Impact Assessments that changed after updated 35 Turbine Layout					
Electrocution at 98 Turbine Layout	High	Probable	***High***	Negative	High
With Mitigation at 98 Turbine Layout:	High	Improbable	***Medium***	Negative	High
Electrocution	High	Probable	**Medium**	Negative	High

With Mitigation:	High	Improbable	**Low**	Negative	High
Visual					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Wind Turbines	Very High	Definite	High	Negative	High
With Mitigation:	Medium	Probable	Medium	Negative	Medium
Powerlines / Infrastructure	Medium	Definite	Medium	Negative	High
With Mitigation:	Low	Probable	Low	Negative	Medium
Noise					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Operational Noise	Low	Possible	Low	Negative	High
Social					
Impact Assessments that remained the same after updated 35 Turbine Layout					
Establishment of Community Trust	Medium	Definite	Medium (Positive)	Positive	High
With Mitigation:	High	Definite	High (Positive)	Positive	High
Promotion of renewable energy projects	Medium	Definite	Medium (Positive)	Negative	High
With Mitigation:	Medium	Definite	Medium (Positive)	Positive	High
Visual impact and impact on sense of place	High	Definite	High (Negative)	Negative	High
With Mitigation:	Medium	Definite	Medium (Negative)	Negative	High
Impact on tourism	Medium	Definite	Medium	Negative	High
With Mitigation:	Low	Definite	Low	Negative	High
Impact Assessments that changed after updated 35 Turbine Layout					
Creation of employment and business opportunities at 98 Turbine Layout	Low	Definite	Low (Positive)	Positive	High
With Mitigation at 98 Turbine Layout:	Medium	Definite	***Medium (Positive)***	Positive	High
Creation of employment and business opportunities	Low	Definite	Low (Positive)	Positive	High
With Mitigation:	Medium	Definite	**Low (Positive)**	Positive	High

Table 7:1 Operational Phase Mitigation Measures

Mitigation Measure	Responsibility	Frequency
Ecology		
Wherever excavation is necessary, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species. The recovery of the indigenous shrub/grass layer should be encouraged through leaving some areas intact through the construction phase to create a seed source for adjacent cleared areas. Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. Problem woody species such as *Prosopis* are already present in the area and are likely to increase rapidly if not controlled. Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as there are also likely to be prone to invasion problems. Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Throughout operation. monthly checks
All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance. All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Throughout operation. monthly checks

Mitigation Measure	Responsibility	Frequency
All cleared areas should be revegetated with indigenous perennial grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.		
No unauthorized persons should be allowed onto the site. Any potentially dangerous fauna such snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location. The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects. All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. All vehicles accessing the site should adhere to a low speed limit (30km/h max) to avoid collisions with susceptible species such as snakes and tortoises. If parts of the facility are to be fenced, then no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences as they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of the fence and not the outside.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Throughout operation. monthly checks
Birds		
Turbines must not be constructed within any of the nest site buffers.	Site engineer/ site manager Developer to implement	Throughout operation. Monthly checks

Mitigation Measure	Responsibility	Frequency
The hierarchy of sensitivity scores presented in the Bird Sensitivity Map, should be considered, with preferential turbine placement in areas of Low Sensitivity, and decreasing preference through to High Sensitivity areas. While not classified as no-go areas, it is recommended that placement of turbines in grid cells with a High GCSS be avoided. Where two or more sensitivity areas overlap, the layer with the higher sensitivity designation should take preference. Develop and implement a carcass search programme for birds during the first two years of operation, in line with the South African monitoring guidelines. Develop and implement a 12 to 24 month post-construction bird activity monitoring program that mirrors the pre-construction monitoring surveys completed by Arcus and is in line with the South African post-construction monitoring guidelines. This program must include thorough and ongoing nest searches and nest monitoring. This program should be enhanced to include sampling during dusk and dawn. Frequent and regular review of operational phase monitoring data (activity and carcass) and results by the bird specialist. This review should also establish the requirement for continued monitoring studies (activity and carcass) throughout the operational and decommissioning phases of the development. The above reviews should strive to identify sensitive locations at the development including turbines and areas of increased collisions with power lines that may require additional mitigation. If unacceptable impacts are observed (in the opinion of the bird specialist), the specialist should conduct a literature review specific to the impact (e.g. collision and/or electrocution) and provide updated and relevant mitigations to be implemented. As a starting point for the review of possible mitigations, the following may need to be considered:	ECO and Safety Officer	

Mitigation Measure	Responsibility	Frequency
Assess the suitability of using deterrent devices (e.g. DT Bird and ultrasonic/radar/electromagnetic deterrents for bats) to reduce collision risk. Identify options to modify turbine operation to reduce collision risk.		
Any overhead power lines must be of a design that minimizes electrocution risk by using adequately insulated 'bird friendly' monopole structures, with clearances between live components of 2 m or greater.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Throughout operation. monthly checks
The on-site WEF manager (or a suitably appointed Environmental Manager) must be trained by the avifaunal specialist to identify the potential priority species and Red Data species as well as the signs that indicate possibly breeding by these species. If a priority species or Red Data species is found to be breeding (e.g. a nest site is located) on the operational Wind Farm, the nest/breeding site must not be disturbed and the avifaunal specialist must be contacted for further instruction.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Throughout operation. monthly checks
Bats		
Turbine placement should only be in areas of Low-Medium and Medium bat sensitivity. No part of any turbine, including the rotor swept zone should be constructed within areas of Medium-High or High bat sensitivity. Clearing of natural and agricultural areas be kept to a minimum. Minimize impacts to wetlands and water resources by following all applicable provisions of the National Water Act Gaps of at least 3 turbine blade lengths are left open between turbines, from blade tip to blade tip. Keep road, turbine and sub-station lighting to minimum.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Throughout operation. monthly checks

Mitigation Measure	**Responsibility**	**Frequency**
Minimize use of high intensity lighting, steady-burning, or bright lights such as sodium vapour, quartz, halogen, or other bright spotlights. With the exception of red aviation safety lights on lights on the turbines and meteorological masts, lights should be hooded downward and directed to minimize horizontal and skyward illumination. All internal turbine nacelle and tower lighting should be extinguished when unoccupied.		
Turbine engineer's work with bat specialists to build in the necessary turbine adaptions needed for erecting bat detectors or deterrent devices on the turbines in the design phase, so there are no unexpected surprises or concerns after the turbines are built. For areas of Low-Medium and Medium Sensitivity With the exception of when temperatures are below 12°C:	Site engineer/ site manager Developer to implement ECO and Safety Officer	Throughout operation. monthly checks
An initial cut-in speed of 5.25 m/s (approximately 50% of bat activity occurs below this wind speed) is recommended as follows: Not in winter. 20h00 to 04h00 in Summer 18h30 to 04h30 in Autumn 19h00 to 04h00 in Spring	Site engineer/ site manager Developer to implement ECO and Safety Officer	Throughout operation. monthly checks
Operational monitoring according to Aronson *et al.* (2014) or any more recent revisions to this document, reporting and adaptive management will be key to keeping the residual impact of the facility as low as possible. This data should be fed into the SANBI database to assist with enhancing the scientific knowledge base for information decision making and mitigation recommendations	Site engineer/ site manager Developer to implement ECO	Throughout operation. monthly checks
Construction phase monitoring on at least one met mast in each phase commences as soon as Phase 1	Site engineer/ site manager Developer to implement	Throughout operation. monthly checks

Mitigation Measure	Responsibility	Frequency
construction of any sort starts. Any additional mitigation measures that arise from the monitoring and from lessons learned from Phase 1 operational monitoring, get implemented in Phase 2.	ECO	
Pre-construction and operational monitoring bat data to feed into the SANBI bird and bat toolkit. Monthly carcass searching reports to be submitted to the SABAAP.	Site engineer/ site manager Developer to implement ECO	Throughout operation. monthly checks
As new information becomes available with regard to successful mitigation strategies tested, this information should feed into the adaptive management plan.	Site engineer/ site manager Developer to implement ECO	Throughout operation. monthly checks
Social		
The enhancement measures listed in Construction phase Section, i.e. to enhance local employment and business opportunities during the construction phase, also apply to the operational phase. In addition: The proponent should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's and locals employed during the operational phase of the project; The proponent, in consultation with the BWLM, should investigate the options for the establishment of a Community Development Trust	Developer to implement	Throughout operation. monthly checks
The BWLM and members from the local Murraysburg community should be consulted as to the structure and identification of potential trustees to sit on the Trust. The key departments in the BWLM that should be consulted include the Municipal Managers Office, IDP and LED Manager. Clear criteria for identifying and funding community projects and initiatives in the area should be identified. The criteria should be aimed at maximising	Developer to implement	Throughout operation. monthly checks

Mitigation Measure	Responsibility	Frequency
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 funds generated for the Community Trust from the WEF.		
The proponent should implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's employed during the operational phase of the project.	Developer to implement	Throughout operation. monthly checks

8 ALIEN INVASIVE MANAGEMENT PLAN

8.1 Purpose of the Alien Invasive Management Plan

The purpose of the Umsinde Emoyeni WEF Alien Invasive Management Plan is to provide a framework for the management of alien and invasive plant species during the construction and operation of the Umsinde Emoyeni Wind Energy Facility. The broad objectives of the plan includes the following:

- Ensure alien plants do not become dominant in parts or the whole site through the control and management of alien and invasive species presence, dispersal & encroachment
- Initiate and implement a monitoring and eradication programme for alien and invasive species
- Promote the natural re-establishment and planting of indigenous species in order to retard erosion and alien plant invasion.

8.2 Problem Outline

Alien plants replace indigenous vegetation leading to severe loss of biodiversity and change in landscape function. Potential consequences include loss of biodiversity, loss of grazing resources, increased fire risk, increased erosion, loss of wetland function, impacts on drainage lines, increased water use etc.

In addition, the Conservation of Agricultural Resources Act (Act 43 of 1983), as amended in 2001, requires that land users clear *Declared Weeds* from their properties and prevent the spread of *Declared Invader Plants* on their properties.

Table 3 of CARA (the Conservation of Agricultural Resources Act) lists all declared weeds and invader plants. Alien plants are divided into 3 categories based on their risk as an invader.

- Category 1 - These plants must be removed and controlled by all land users. They may no longer be planted or propagated and all trade in these species is prohibited.
- Category 2 – These plants pose a threat to the environment but nevertheless have commercial value. These species are only allowed to occur in demarcated areas and a land user must obtain a water use licence as these plants consume large quantities of water.
- Category 3 – These plants have the potential of becoming invasive but are considered to have ornamental value. Existing plants do not have to be removed but no new plantings may occur and the plants may not be sold.

The following guide is a useful starting point for the identification of alien species: Bromilow, C. 2010. *Problem Plants and Alien Weeds of South Africa*. Briza, Pretoria.

8.2.1 Vulnerable Ecosystems and Habitats

Certain habitats and environments are more vulnerable to alien plant invasion and are likely to bear the brunt of alien plant invasion problems at the site. In addition, construction activities and changes in water distribution at the site following construction are also likely to increase and alter the vulnerability of the site to alien plant invasion.

Areas at the site which are likely to require specific attention include the following:

- Wetlands, drainage lines and other mesic areas
- Cleared and disturbed areas such as road verges, crane pads and construction footprints etc.

- Construction camps and lay-down areas which are cleared or are active for an extended period

8.2.1.1 Wetlands, drainage lines and other mesic areas

There are a relatively large number of drainage lines at the site as well as a number of artificial wetlands. Disturbance within these areas often results in alien plant invasion on account of the greater water and nutrient availability in this habitat. Although there are no turbines within such areas, numerous road crossings will be required. The disturbance footprint within such areas should be minimized and these areas should be checked for alien species more than the surrounding landscape.

8.2.1.2 Cleared and disturbed areas

Cleared and disturbed areas are clearly vulnerable to invasion on account of the lack of existing plant cover to resist invasion as well as the disturbance created during construction which promoted the germination and establishment of alien plant species.

8.2.1.3 Construction camps and laydown areas

Construction camps and lay down areas are either cleared of vegetation or prolonged activities in these areas result in negative impact on indigenous vegetation. In addition, repeated vehicle and human activity in these areas usually results in the import of alien plant seed on clothes, dirty vehicles or with construction machinery and materials

8.3 General Clearing and Guidance Principles

- Alien control programs are long-term management projects and should include a clearing plan which includes follow up actions for rehabilitation of the cleared area. Alien problems at the site should be identified during pre-construction surveys of the development footprint. This may occur simultaneously to other required reaches and surveys. The clearing plan should then form part of the pre-construction reporting requirements for the site.
- The plan should include a map showing the alien density & indicating dominant alien species in each area.
- Lighter infested areas should be cleared first to prevent the build-up of seed banks.
- Pre-existing dense mature stands ideally should be left for last, as they probably won't increase in density or pose a greater threat than they are currently.
- Collective management and planning with neighbours may be required in the case of large woody invaders as seeds of aliens are easily dispersed across boundaries by wind or water courses.
- All clearing actions should be monitored and documented to keep track of which areas are due for follow-up clearing.

8.4 Clearing Methods

- Different species require different clearing methods such as manual, chemical or biological methods or a combination of both.
- However care should be taken that the clearing methods used do not encourage further invasion. As such, regardless of the methods used, disturbance to the soil should be kept to a minimum. Fire is not a natural phenomenon in the area and fire should not be used for alien control or vegetation management at the site.
- The best-practice clearing method for each species identified should be used. The preferred clearing methods for most alien species can be obtained from the DWAF Working for Water Website. http://www.dwaf.gov.za/wfw/Control/

8.5 Use of Herbicide for Alien Control

Although it is usually preferable to use manual clearing methods where possible, such methods may create additional disturbance which stimulates alien invasion and may also be ineffective for many woody species which re-sprout. Where herbicides are to be used, the impact of the operation on the natural environment should be minimised by observing the following:

- Area contamination must be minimised by careful, accurate application with a minimum amount of herbicide to achieve good control.
- All care must be taken to prevent contamination of any water bodies. This includes due care in storage, application, cleaning equipment and disposal of containers, product and spray mixtures.
- Equipment should be washed where there is no danger of contaminating water sources and washings carefully disposed of in a suitable site.
- To avoid damage to indigenous or other desirable vegetation, products should be selected that will have the least effect on non-target vegetation.
- Coarse droplet nozzles should be fitted to avoid drift onto neighbouring vegetation.
- The appropriate health and safety procedures should also be followed regarding the storage, handling and disposal of herbicides.

For all herbicide applications, the following guidelines should be followed:

Working for Water: Policy on the Use of Herbicides for the Control of Alien Vegetation.

9 ALIEN PLANT MANAGEMENT PLAN

9.1 Construction Phase Activities

The following management actions are aimed at reducing soil disturbance during the construction phase of the development, as well as reducing the likelihood that alien species will be brought onto site or otherwise encouraged.

Construction Phase Action	Frequency
The ECO is to provide permission prior to any vegetation being cleared for development.	Daily
Clearing of vegetation should be undertaken as the work front progresses – mass clearing should not occur unless the cleared areas are to be surfaced or prepared immediately afterwards.	Weekly
Where cleared areas will be exposed for some time, these areas should be protected with packed brush, or appropriately battered with fascine work. Alternatively, jute (Soil Saver) may be pegged over the soil to stabilise it.	Weekly
Cleared areas that have become invaded can be sprayed with appropriate herbicides provided that these are such that break down on contact with the soil. Residual herbicides should not be used.	Weekly
Although organic matter is frequently used to encourage regrowth of vegetation on cleared areas, no foreign material for this purpose should be brought onto site. Brush from cleared areas should be used as much as possible. The use of manure or other soil amendments is likely to encourage invasion.	Weekly
Clearing of vegetation is not allowed within 32 m of any wetland, 80 m of any wooded area, within 1:100 year floodlines, in conservation servitude areas or on slopes steeper than 1:3, unless permission is granted by the ECO for specifically allowed construction activities in these areas	Weekly
Care must be taken to avoid the introduction of alien plant species to the site and surrounding areas. (Particular attention must be paid to imported material such as	Weekly

building sand or dirty earth-moving equipment.) Stockpiles should be checked regularly and any weeds emerging from material stockpiles should be removed.	
Alien vegetation regrowth on areas disturbed by construction must be controlled throughout the entire site during the construction period.	Monthly
The alien plant removal and control method guidelines should adhere to best-practice for the species involved. Such information can be obtained from the DWAF Working for Water website.	Monthly
Clearing activities must be contained within the affected zones and may not spill over into demarcated No Go areas.	Daily
Pesticides may not be used. Herbicides may be used to control listed alien weeds and invaders only	Monthly
Wetlands and other sensitive areas should remain demarcated with appropriate fencing or hazard tape. These areas are no-go areas (this must be explained to all workers) that must be excluded from all development activities.	Daily

9.1.1 Monitoring Actions - Construction Phase

The following monitoring actions should be implemented during the construction phase of the development.

Monitoring Action	Indicator	Timeframe
Document alien species present at the site	List of alien species	Pre-construction
Document alien plant distribution	Alien plant distribution map within priority areas	3 Monthly
Document & record alien control measures implemented	Record of clearing activities	3 Monthly
Review & evaluation of control success rate	Decline in documented alien abundance over time	Biannually

9.2 Operational Phase Activities

The following management actions are aimed at reducing the abundance of alien species within the site and maintaining non-invaded areas clear of aliens.

Operational Phase Action	Frequency
Surveys for alien species should be conducted regularly. Every 6 months for the first two years after construction and annually thereafter. All aliens identified should be cleared.	Every 6 months for 2 years and annually thereafter
Where areas of natural vegetation have been disturbed by construction activities, revegetation with indigenous, locally occurring species should take place where the natural vegetation is slow to recover or where repeated invasion has taken place following disturbance.	Biannually, but revegetation should take place at the start of the rainy season
Areas of natural vegetation that need to be maintained or managed to reduce plant height or biomass, should be controlled using methods that leave the soil protected, such as using a weed-eater to mow above the soil level.	When necessary
No alien species should be cultivated on-site. If vegetation is required for esthetic purposes, then non-invasive, water-wise locally-occurring species should be used.	When necessary

9.2.1 Monitoring Actions - Operational Phase

The following monitoring actions should be implemented during the construction phase of the development.

Monitoring Action	Indicator	Timeframe
Document alien species distribution and abundance over time at the site	Alien plant distribution map	Biannually
Document alien plant control measures implemented & success rate achieved	Records of control measures and their success rate. A decline in alien distribution and cover over time at the site	Quarterly
Document rehabilitation measures implemented and success achieved in problem areas	Decline in vulnerable bare areas over time	Biannually

9.3 Decommissioning Phase Activities

The following management actions are aimed at preventing the invasion, by alien plant species, of the re-vegetated areas created during the decommissioning phase. Re-vegetation of the disturbed site is aimed at approximating as near as possible the natural vegetative conditions prevailing prior to operation.

Decommissioning Phase Action	Frequency
All damaged areas shall be rehabilitated if the infrastructure is removed and the facility is decommissioned	Once off
All natural areas must be rehabilitated with species indigenous to the area. Re-seed with locally-sourced seed of indigenous grass species that were recorded on site pre-construction.	Once off, with annual follow up re-vegetation where required
Maintain alien plant monitoring and removal programme for 3 years after rehabilitation.	Biannually

9.3.1 Monitoring Actions - Decommissioning Phase

The following monitoring and evaluation actions should take place during the decommissioning phase of the development

Monitoring Action	Indicator	Timeframe
Monitor newly disturbed areas where infrastructure has been removed to detect and quantify any aliens that may become established for 3 years after decommissioning and rehabilitation	Alien plant surveys and distribution map	Biannually until such time as the natural vegetation has recovered sufficiently to resist invasion.
Monitor re-vegetated areas to detect and quantify any aliens that may become established for 3 years after decommissioning and rehabilitation	Alien plant surveys and distribution map	Biannually for 3 years

Document alien plant control measures implemented & success rate achieved	Records of control measures and their success rate. A decline in alien distribution and cover over time at the site	Annually for 3 years

10 PLANT RESCUE AND PROTECTION PLAN

10.1 Purpose

The purpose of the plant rescue and protection plan is to implement avoidance and mitigation measures to reduce the impact of the development on listed and protected plant species and their habitats. Although this report identifies those species suitable for search and rescue at the site, it is important to note that a preconstruction walk-through of the site would also be important to refine the list of species identified for search and rescue, as well as locate such species prior to construction.

The objective of resuing plants on the project area is to prevent the loss of species either directly or through future extinction and minimising impacts of development on population dynamics of species of conservation concern.

Preserving the natural configuration of habitats as part of ecosystems, thus ensuring a diverse but stable hydrology, substrate and general environment for species to be able to become established and persist.

10.2 Effect of removing individual species of conservation concern

Species of conservation concern are declining either due to overexploitation or because their range of occupancy is limited and further infringed on by development. Most plant populations require a certain minimum number of individuals within a population or metapopulation to allow for sufficient genetic transfer between individuals. This prevents genetic erosion and hence weakening of the ability of individuals to persist in their environments. Similarly, where the distance between metapopulations is significantly increased due to fragmentation and the resultant loss of some populations, populations may suffer genetic decline due to restricted movement of pollen. Pollinators or other species that depend on a particular plant species for a specific microhabitat or food source may be equally affected because of the reduction of available resources. Therefore the aim of plant rescue actions are always to maintain as many individuals of a plant population in as close proximity to the original habitat as possible to minimise loss of individuals and fragmentation of populations to prevent the creation of future extinction debts of the development.

10.3 Plant Rescue and Protection

Successful plant rescue can only be achieved if:

- Species can be removed from their original habitat with minimal damage to the plant, especially the roots.
- All plants removed are safely stored and treated according to their specific requirements prior to being transplanted again.
- They are relocated into a suitable habitat and protected from further damage and all disturbances to aid their re-establishment.
- Timing of planting activities is planned with the onset of the growing season.
- Steps are taken where necessary to aid the initial establishment of vegetation, including occasional watering.

10.4 Time of Planting

- All planting shall be carried out as far as is practicable during the period most likely to produce beneficial results (i.e. during the peak growing season), but as soon as possible after completion of a section of earthworks.
- Drainage line rehabilitation preparation must be done during autumn, and planting of appropriate species in these areas should commence during early spring after the first rains.

10.5 Plant Search and Rescue

Prior to construction, once all the areas where topsoil will be removed or areas will be transformed have been demarcated, the ECO and contractor will be responsible to remove all bulbous species from the topsoil, as well as succulents and small indigenous shrubs that can be transplanted. These are to be kept in a raised, protected position in a designated area until they can be replanted again as part of the rehabilitation process. Further details are listed in the Re-vegetation and Habitat rehabilitation Plan.

11 RE-VEGETATION AND HABITAT REHABILITATION PLAN

The Revegetation and Habitat Rehabilitation Plan addresses the need to mitigate all impacts leading to disturbed vegetation, loss of species and/or agricultural potential, disturbed soil surfaces, and generally bare soils prone to erosion and further degradation on the proposed development site. The plan overlaps to some degree with the Erosion Management Plan, and for successful rehabilitation, it is imperative that this plan is at all times used in conjunction with other EMPs mentioned.

The objective of the plan is therefore to provide:

- Protocols for the removal, temporary storage and replanting of plant species of conservation concern Protocols for the rehabilitation of vegetative cover across the project area
- Tools for planning the rehabilitation work and responding to unforeseen events Guidelines on implementation and post-implementation tasks Criteria for evaluating rehabilitation success
- A summary of items to be included in the rehabilitation budget to ensure that there is sufficient allocation of resources on the project budget so that the scale of EMP-related activities is consistent with the significance of project impacts

The objective of rehabilitation and revegetation of the development area is:

- Preventing the loss of species either directly or through future extinction and minimising impacts of development on population dynamics of species of conservation concern.
- Preserving the natural configuration of habitats as part of ecosystems, thus ensuring a diverse but stable hydrology, substrate and general environment for species to be able to become established and persist.
- Preserving or re-creating the structural integrity of natural plant communities. Actively aid the improvement of indigenous biodiversity according to a desirable end state according to a previously recorded reference state. This reference state, if healthy, will be dynamic and able to recover after occasional disturbances without returning to a degraded state.
- Improving the ecosystem function of natural landscapes and their associated vegetation.
- Successful rehabilitation can only be achieved with: »A long-term commitment »Practical, adaptive management »Viable goals of desired outcomes

Prior to vegetation rehabilitation, all stakeholders involved should be consulted to determine:

- What the rehabilitation is ultimately aiming for– rehabilitation of cropping/grazing lands or rehabilitation of indigenous vegetation, after soil erosion and storm water management is in place and IAPs have been cleared?
- A clear definition of incompatible and compatible vegetation on and in the immediate surroundings of the development must be defined and maintained as such. No tree or shrubs shall be allowed to grow to a height in excess of the horizontal distance of that tree or shrub from the nearest newly developed structure or to grow in such a manner as to endanger the development or its operation
- Who will take long-term ownership and hence responsibility for the rehabilitation and its subsequent monitoring and management? Continued monitoring of vegetation establishment and composition, as well as erosion detection will have to be coupled with continued follow-up maintenance of rehabilitation and erosion control from commencement of activity up to the decommissioning phase.
- The ultimate objective for rehabilitation should focus on the stabilisation of soil erosion, retaining agricultural potential of transformed areas and /or the establishment of a dense and protective plant cover and the maintenance of habitats to enable vegetation to persist and flourish on rehabilitated areas indefinitely, ultimately relying only on environmental resources.

11.1 Map and create management areas

The entire project area must be mapped and divided into management areas indicating:

- Current land cover
  - Roads and residential
  - Areas with IAPs, subdivided further in sparse or dense infestations where applicable
  - Transformed areas
  - Untransformed indigenous vegetation

For every one of the management areas, the project proponent, in consultation with the land users, will have to decide what intervention will be necessary, desirable, and feasible to enable the development of the project and long-term sustainable maintenance of infrastructure. Thus for every management area there must be an operational outline on:

- what will happen there
- what needs to be mitigated – including storm water- and erosion management
- which management units need priority intervention/mitigation
- how will this mitigation / intervention be done (method statements) including schedule of work
- realistic and desirable end states including list of species that should be established to initiate rehabilitation after initial revegetation
- approximate timeframes
- monitoring protocol to evaluate success or failures of interventions
  - establish permanently marked transects and monitor with fixed-point photography who will be responsible for doing what how will different actions be integrated to achieve and maintain or improve the desirable end state of the environment of that management unit

Special attention will have to be given to drainage zones, as these not only have very active morphodynamics, but are also distributers of seeds – both indigenous and of IAPs. Thus clearing a downstream invasion of aliens to enable maintenance of the development will be futile if the upstream IAPs are not cleared or at least aggressively controlled.

11.2 Setting realistic rehabilitation goals

Rehabilitation efforts typically aim at improving ecosystem function that consists of a series of processes, which can in the end be evaluated against a desired outcome or reference state of the vegetation and environment.

Attainable goals of rehabilitation on the project area should be possible and viable for at least the following:

Attainable goals of rehabilitation on the project area should be possible and viable for at least the following:

- Stabilisation of soils
- Stabilisation of riparian areas
- Storm water reduction through management and wetland integrity
- Clearing of IAPs
    - The degree to which IAPs can be cleared from the project area needs to be determined according to desirability, available project funding, personnel and project requirements
- Restoring and/or rehabilitating vegetative cover on non-transformed areas to obtain an acceptable vegetation cover that can be maintained or persists on its own indefinitely

11.3 Remove or ameliorate the cause of degradation

This will include:

- Physical rehabilitation of topsoil where it has been removed.
- Topsoil on areas that have not been cultivated are considered as the upper 20 - 30 cm only. These contain the most important nutrients, micro flora and –fauna essential for nutrient cycling processes. Topsoils are also an important source of seeds.
- Subsoils and overburden substrata lack the above elements and will first have to be used for physical rehabilitation of landscapes as and where necessary, and then overlain with topsoils
- Stabilisation of topsoils and prevention of erosion – refer to the Erosion management pan
- Removal of all invasive vegetation – refer to the Alien Invasive Management Plan
    - Where it is desirable to use brush or logs of the cleared vegetation for soil stabilisation, such material must be free of regenerative material – e.g. seeds or root suckers

11.4 Initial Revegetation

Immediately after clearing of vegetation, the soil surface must be inspected for signs of erosion and stabilised as soon as possible. After completion of construction, such erosion stabilisation should preferably be with a cover of vegetation. A dense initial grass or other perennial cover will be desirable. The appropriate seed mix should be determined in consultation with an ecologist familiar with the area. The aim of the first vegetation cover is to form a protective, relatively dense indigenous layer to slow runoff, increase moisture infiltration into the soil, and gradually change the soil nutrient status in order for it to be more favourable for other desirable indigenous vegetation to become established.

11.5 Natural seed banks and improvement of plant structural and compositional diversity

It is expected that soil seed banks of indigenous vegetation will be present to initiate initial vegetation cover, but may not be sufficient to establish an acceptable cover of desirable species. After deciding which indigenous species should be re-introduced, seed should be ideally collected from site or an environmentally-matched site nearby.

Seed collection may be done throughout the year as seed ripens, but can also be restricted to summer, when a large amount of the perennial seed should have ripened. Seeds should be stored in paper or canvas bags dusted with insecticide, and sown at the onset of the rainy season.

Alternatively, slower-growing perennials may be raised from seed or cuttings in a nursery and then transplanted once established. It will be beneficial to investigate if community members would be able to create and maintain such a nursery, or if there are nurseries in the area, that raise indigenous flora from the area.

The final vegetation cover should resemble the original (non-encroached) vegetation composition and structure as far as practicable possible or permissible within each management unit.

For drainage areas:

- First restore drainage line morphology following the guidelines of the Erosion Management Plan – without that ecological recovery cannot be initiated
- Determine if natural seed sources may be present further upstream
- If such upstream seed sources are still present, rehabilitation of riparian vegetation after soil erosion management will most likely occur naturally, PROVIDED that follow-up monitoring of the establishment of vegetation is carried out, and all invasive species eradicated as they emerge. This can only be achieved with a long-term commitment (> 5 years minimum)
- Should no upstream seed resources be available, suitable species (as determined in consultation with an ecologist) should be sown or planted.

11.6 Monitoring and follow-up action

Throughout the lifecycle of the development, regular monitoring and adaptive management must be in place to detect any new degradation of ecosystems affected by the development, and remedy these as soon as detected.

During the construction phase, the ECO and contractor will be responsible for initiating and maintaining a suitable monitoring system. Once the development is operational, the project proponent will have to identify a suitable entity that will be able to take over and maintain the monitoring cycle and initiate adaptive management as soon as it is required. Monitoring personnel must be adequately trained.

The following are the minimum criteria that should be monitored:

- Composition and density of replanted vegetation, distinguishing between species introduced for initial revegetation only and species that are part of the pre-determined desirable end state
- Associated nature and stability of surface soils
  - It is recommended that permanent transects are marked and surveyed annually according to the LFA technique (Tongway and Hindley 2004), adapted to integrate both surface soil characteristics and the vegetation to be monitored
- Re-emergence of IAPs
  - If noted, remedial action must be taken immediately according to Working for Water specifications
- Nature and dynamics of riparian zones
  - Stability of riparian vegetation

- Any form of bank erosion, slumping or undercutting
- Stability of channel form and width of streams – if this increases, it shows that vegetation on plains and/or riparian areas and upper drainage lines are not yet in a stable enough state to be fully functional in reducing excess runoff and the ecosystem overall is losing valuable resources

11.7 Timeframes and duration

- Rehabilitation will occur during construction, as areas for the re-application of topsoil and revegetation become available or where revegetation can be initiated after clearing of invasives or to stabilise erosion.
- The initial revegetation period post construction is estimated to be over a period of 6 (minimum) to 12 months (maximum), or a time period specified by the Horticultural Landscape Contractor, particularly if planting of trees and shrubs occurs.
- The rehabilitation phase (including post seeding maintenance) should be at least 12 months (depending on time of seeding and rainfall) to ensure establishment of an acceptable plant cover is achieved (excluding invasive plant species or weeds).
- If the plants have not established and the acceptable plant cover is not achieved within the specified maintenance period, maintenance of these areas shall continue until at acceptable plant cover is achieved (excluding alien plant species or weeds).
- Additional seeding or planting may be necessary to achieve acceptable plant cover. Hydroseeding may have to be considered as an option in this case.
- Any plants that die, during the maintenance period, shall be replaced by the Horticultural Landscape Contractor (at the Horticultural Landscape Contractor's cost if it was due to insufficient maintenance).
- Succession of natural plant species should be encouraged
- Monitoring of rehabilitation success and follow-up adaptive management, together with clearing of emerging invasives shall be carried on until the decommissioning phase has been completed.

12 OPEN SPACE MANAGEMENT PLAN

The objective of open space management is to restore, enhance and rehabilitate open spaces, improve climate change adaptations through the minimisation of biodiversity loss, and mitigate against environmental degradation. Management actions consider open spaces and natural areas as well as community perceptions of these.

In the context of the proposed grid connections and substations the primary purpose of the open plan management plan is therefore to:

- Minimise visual impact on the character of the area; and
- Maintain biodiversity within the area to ensure that no long-term negative impacts occur on the local environment.

The proposed grid connection connections and associated infrastructure have the potential to impact negatively on the character of the area, as identified in the Visual Impact Assessment conducted during the EIA phase. The following actions must be implemented to minimise this visual impact:

- Grid connection route to avoid visually sensitive peaks, major ridgelines, scarp edges and slopes steeper than 1:5 gradient
- Substation to be sited in unobtrusive low-lying areas, away from roads and habitations, and screened by berms and/or tree-planting where feasible.
- Operations and maintenance buildings and parking areas to be located in an unobtrusive area and consolidated to avoid sprawl of buildings in the open landscape.
- Access roads to be in sympathy with the contours, avoid steep 1:5 slopes and drainage courses, and kept as narrow as possible.

- Access and haul roads to use existing farm tracks as far as possible.
- Construction camp, stockpiles and lay-down area to be located out of sight of district roads, possibly in the vicinity of the proposed substation and O&M buildings.
- Disturbed areas rather than pristine or intact land to preferably be used for the construction camp. Construction camp and laydown areas to be limited in area to only that which is essential.
- Measures to control wastes and litter to be included in the contract specification documents.
- Provision to be made for rehabilitation/ re-vegetation of areas damaged by construction activities.

In order to maintain biodiversity the Alien Invasive, Plant Rescue and Protection and Re-vegetation and Habitat Management Plans must be adhered to.

In addition the following actions should implemented by the Contractor and Project Company:

- Promote environmental awareness in all employees and sub-contractors and create an understanding of the environmental sensitivities of the project site;
- No waste, including organic matter may be disposed of anywhere on site, except in provided bins placed at convenient locations, especially during the construction period. Disciplinary actions should be taken against littering.
- Open spaces are to be kept free of alien plants and weeds;
- Indigenous plants may not be collected or removed from the site;
- Access to the facility should be strictly controlled
- All visitors and contractors should be required to sign-in
- Signage at the entrance should indicate that disturbance to fauna and flora is strictly prohibited

The following activities should not be permitted by anyone except the landowner or his representatives:

- No fires within the site
- No hunting, collecting or disturbance of fauna and flora, except where required for the safe operation of the facility and only by the Environmental Officer on duty and with the appropriate permits and landowner permission.
- No driving off of demarcated roads
- No interfering with livestock

12.1 Grazing Management

The development of the wind energy facility will not prevent the site from being used for its current landuse of extensive livestock production. Extensive livestock grazing is compatible with biodiversity maintenance provided that it is implemented according to the basic principles of sustainable grazing management. While the majority of these are beyond the scope of the current plan, the following basic principles should be adhered to:

- A grazing management plan for the site should be developed in cooperation with Agricultural Extension services.
- The stocking rate applied should be within the recommended limits as identified by the Department of Agriculture.
- Livestock should be rotated through the different paddocks at the site in a manner which allows for the growth and recovery of the vegetation between grazing events.
- Precautions should be taken to ensure that the development of the site does not increase the risk of stock theft within the facility. These include access control as previously described, as well as security patrols.

13 TRAFFIC MANAGEMENT PLAN

The objective of the traffic management plan is the prevention of incidents from the use of vehicles and disturbance of local traffic on public roads during the construction, operation and decommissioning phases of the proposed projects. Traffic volumes are most likely to increase during the construction phase. However, due to the remote location of the site, and the low volume of traffic on public roads in the area the impact is expected to be low.

Actions to be implemented by the Contractor and Project Company:

- Site-specific traffic plan to be developed and implemented during the detailed design phase prior to construction;
- Limit use of private cars by arranging mini bus transport service for workers;
- Monitor for overloading of vehicles;
- Use only well trained, suitably qualified and experienced drivers in possession of an appropriate and valid driver's license;
- All vehicles must be roadworthy and serviced regularly;
- Clear and visible signage must be placed on and around site, clearly demarcating safe entry and exit points;
- Require all drivers to abide by standard road and safety procedures on site;
- When travelling on public roads all speed limits and rules of the road must be adhered to; and
- Limit dust generation by applying dust suppressants and postponing dust generating activities during period of strong winds and enforcing a strict speed limit of 40 km/h on unpaved roads.

Monitoring actions to be conducted by the ECO

- Maintain incidents/complaints register for community complaints;
- Monitor dust generation and implementation of management actions detailed above.

14 TRANSPORTATION MANGEMENT PLAN

The Transportation Management Plan aims to ensure the safe transportation of all components required for the construction of the proposed projects to the construction site. This includes the, turbines, substation transformers, electrical cables and pylon structures.

The following actions should be implemented by the developer and Contractor:

- Apply for all relevant permits for abnormal loads and route clearances with the relevant authorities prior to construction;
- Appoint a qualified specialist to conduct a detailed site-specific Transport Risk Assessment during the detailed design phase and prior to construction;
- Determine the pre-construction condition of the road immediately prior to construction by carrying out a condition assessment or from recent pavement management system condition assessments if available from the Provincial Authorities;
- Public notices regarding any planned abnormal load transports must be placed at the construction site to inform affected parties;
- Abnormal loads must conform with legal maximum dimensions, and vehicles carrying abnormal loads must display sufficient signage;
- Any roads damaged during the transportation of components, or from other construction vehicles must be rehabilitated and returned to pre-construction conditions.

The following monitoring activities should be carried out by the ECO:

- Conduct site audits and report non-compliance with the above-mentioned conditions

15 STORMWATER MANGEMENT PLAN

The objective of the storm water management plan (SWMP) is to prevent increased soil erosion, to contain any contaminated run-off and to avoid water logging and pollution. The Erosion Management Plan (see below) must therefore be seen in conjunction with the SWMP. Actions are listed that will ensure that storm water is channelled in a controlled manner from roads and substations towards natural drainage lines, without impeded natural surface flows.

- Develop and implement a site-specific storm water management plan during the detailed design phase of the projects and prior to construction;
- In the detailed design phase of the project minimise any water crossings and utilise existing roads wherever possible;
- Enforce 32 m construction buffers of all rivers, streams and waterbodies;
- Should new roads be required to cross any banks or channels these must be secured with erosion protection (ie. gabions etc);
- Monitor for erosion during the clearing of vegetation;
- Avoid hard-engineered surfaces (ie. construct gravel roads and not asphalt roads wherever possible);
- Roads in steep areas must be equipped with side drainages and culverts that channel the run-off to natural drainage lines without gaining velocity and causing erosion;
- Construction camps and temporary ablution facilities must be located beyond the 1:100 year floodline;
- Stockpiles must be located on flat areas and protected from erosion;
- The substation site design must include side water outlets and an adequate slope to allow storm water run-off from the paved areas;
- Prevent surface run-off from areas of potential contamination

16 EROSION MANGEMENT PLAN

16.1 Purpose

The purpose of the erosion management plan is to implement avoidance and mitigation measures to reduce the erosion potential and the likely impact of erosion associated with the construction and operational phases of the proposed facility. As part of the management plan, measures to protect hydrological features from erosion damage are included.

16.2 Scope and Limitations

This plan is intended at introducing measures aimed at reducing the negative impacts of erosion on biodiversity as well as reducing the vulnerability of the site to erosion problems during the construction and operational phases of the development. The focus is on managing runoff and reducing the construction phase impact on ecologically sensitive areas. The plan does not cover engineering-side issues which are of relevance to soil management and erosion. Therefore issues such as the potential presence of heaving clays, compressible soils, perched water tables, dispersive soils and corrosive groundwater at the site are beyond the general scope of this study and are not directly dealt with. These issues would need to be addressed and their relevance assessed during detailed geotechnical investigation of the site.

16.3 Background

16.3.1 Types of Erosion

Erosion comes in several forms, some of which are not immediately obvious. The major types of erosion are briefly described below:

Raindrop impact

This is the erosion that occurs due to the "bomb blast" effect of raindrop impact. Soil particles can be blasted more than a meter into the air. Apart from loosening soil particles, the effect can also break soil aggregates apart and form a clay seal on the surface which resists infiltration and results in increased levels of runoff. This effect is most important when large areas of exposed soils are present. If the site is cleared, then this effect will play an important role as it results in the soil surface becoming sealed which reduces infiltration and increases runoff, leading to erosion.

Sheet Erosion

This is the removal of a shallow and uniform layer of soil from the surface. It is caused initially by raindrop splash and then by runoff. Sheet erosion is often difficult to see as no perceptible channels are formed. Accumulated sediment at the bottom of the slope is often the only indicator. This is likely to be an important erosion type at the site given the gently sloping nature of the site and the susceptible soils.

Rill Erosion

This is the removal of soil from the surface whereby small channels or rills up to 300 mm are formed. It is caused by runoff concentrating into depressions, wheel tracks etc.

Gully Erosion

This is the removal of soil from the surface and sub-surface caused by concentrated runoff eroding channels greater than 300mm deep. Gully erosion often begins as rill erosion.

Wind Erosion

Wind erosion results from soil particles being picked up, bounced or moved by the wind. Wind erosion is primarily a problem in arid areas and may affect sands soils as well as fine-textured soils. Vegetation cover is usually an effective barrier to wind erosion, but large soils losses or degradation can occur in disturbed areas or on croplands.

16.3.2 Promoting Factors

Rainfall characteristics

High-intensity, short-duration storm events have much greater erosion potential than low intensity, longer duration storm events with the same runoff volume. Intense storms produce larger raindrops, and are more likely to break up the soil and dislodge particles.

Soil erodibility

Soil erodibility is determined by the soils ability to resist detachment and transport due to rainfall, runoff and infiltration capacity. Well-structured soils with a high clay content are generally least erodible. Some clays are dispersible meaning that they break down when wet and become highly erodible. Silts and fine sands are highly erodible.

Length and Steepness of Slope

Steeper slopes cause runoff velocities to increase, resulting in increased erosion. As the slope length increases the opportunity for runoff to concentrate and achieve an erosive velocity increases.

Soil Surface Cover

Soil surface cover such as vegetation and mulch protect the soil surface from raindrop impact, reduce flow velocity, disperse flow, and promote infiltration and the deposition of sediment. This is a basic principle underlying many erosion control approaches which aim to modify the surface characteristics in order to reduce the flow velocity and reduce the potential for erosion. In this regard it is important to note that many of the practices which are used to enhance rehabilitation potential are also useful in reducing erosion potential.

16.3.3 Erosion and Sediment Control Principles

The goals of erosion and sediment control during and after construction at the site should be to:

- Protect the land surface from erosion;
- Intercept and safely direct run-on water from undisturbed upslope areas through the site without allowing it to cause erosion within the site or become contaminated with sediment.
- Progressively revegetate or stabilise disturbed areas.
- Prevent damage to hydrological features such as drainage lines or wetlands, either within or adjacent to the site.

These goals can be achieved by applying the following principles:

1. Integrate project design with site constraints.
2. Plan and integrate erosion and sediment control with construction activities.
3. Minimise the extent and duration of disturbance.
4. Control stormwater flows onto, through and from the site in stable drainage structures.
5. Use erosion controls to prevent on-site damage.
6. Use sediment controls to prevent off-site damage.
7. Control erosion and sediment at the source.
8. Stabilise disturbed areas promptly.
9. Inspect and maintain control measures.

16.3.4 On-Site Erosion Management

Exposed and unprotected soils are the main cause of erosion in most situations. Therefore, the erosion management plan and the revegetation and rehabilitation plan should be closely linked to one another and should not operate independently, but should rather be seen as complementary activities within the broader environmental management of the site and should therefore be managed together.

General factors to consider regarding erosion risk at the site includes the following:

- Soil loss will be greater during wet periods than dry periods. Intense rainfall events outside of the wet season, such as occasional unseasonal showers can also however cause significant soil loss. Therefore precautions to prevent erosion should be present throughout the year.
- Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilization. Therefore the gap between construction activities and rehabilitation

should be minimized. Allied to this the fact that topsoil does not store well and should preferably be used within a month or at most within 3 months to aid in the revegetation and rehabilitation of disturbed areas.
- Phased construction and progressive rehabilitation are important elements of the erosion control strategy.
- The extent of disturbance will influence the risk and consequences of erosion. Therefore large areas should not be cleared at a time, especially in areas such as slopes where the risk of erosion is higher.

16.4 Concentration of flows into downstream areas

Road crossings over drainage lines, streams and wetlands can impact downstream wetland ecosystems. Crossings that result in narrowing of the downstream system can result in concentration of flows and channelisation downstream. This may result in a loss of wetland function, and result in the drying out and shrinkage of the wetland area. Erosion and increased vulnerability to invasion of drier banks by alien vegetation may occur.

- Culverts should be adequately spaced such that they do not result in shrinkage of downstream wetlands. Where roads cross minor drainage channels, a single culvert may be adequate, aligned with the downstream drainage line. Where more substantial wetland systems are intercepted by a road, sufficient culverts should be provided such that downstream shrinkage of wetland width does not occur. Moreover, culverts should be aligned, as far impossible, with existing, natural channels.
- All crossings of drainage systems should ensure that both surface and shallow subsurface flows can be accommodated where appropriate and that unnatural channelisation does not occur downstream.

16.5 Runoff Concentration

The increase in hardened surfaces associated with roads, and other infrastructure will elad to a significant increase in volume and velocity of flow generated from these areas during large rainfall events.

Runoff from road surfaces is usually channelled off of the road surface towards the downslope side of the road. On steep slopes, the volumes and velocity of runoff generated may result in erosion of the surrounding areas. Therefore specific measures to curb the speed of runoff water is usually required in such areas, such as rock beds or even gabions. In addition, these areas should be monitored for at least a year after construction to ensure that erosion is not being initiated in the receiving areas. Once erosion on steep slopes has been initiated, it can be very difficult to arrest.

16.5.1Diversion of Flows

Diversion of flows from natural drainage channels may occur when roads interrupt natural drainage lines, and water is forced to run in channels along the manipulated road edge to formalized crossing points. Even slight diversion from the natural drainage line can result in excessive downstream erosion, as the new channel cuts across the slope to reach the valley bottom. Should the access road to the site traverse any major drainage lines, the following principles should apply.

- Adequate culverts should be provided along the length of all roads to prevent diversion of flow from natural drainage lines.
- Culverts should be carefully located, such that outlet areas do in fact align with drainage lines.
- The downstream velocity of runoff should be managed, such that it does not result in downstream erosion – on steep slopes, where roads have been constructed on cut

areas, allowance should be made for culverts to daylight sufficiently far down the slope that their velocities are managed and erosion does not occur.

- Where necessary, anti-erosion structures should be installed downstream of road drains – these may comprise appropriate planting, simple riprap or more formal gabion or other structures.
- Roads and their drainage system should be subject to regular monitoring and inspection, particularly during the wet season, so that areas where head cut erosion is observed can be addressed at an early stage.

16.6 Monitoring Requirements

16.6.1 Construction Phase

The following monitoring actions should be implemented during the construction phase of the development

Monitoring Action	Indicator	Timeframe
Identify all river and drainage line crossings affected by the development	Map of sites of potential concern	Preconstruction
Monitor cleared areas for erosion problems	Record of monitoring site, problems encountered and remedial actions implemented	Monthly during the rainy season and following significant rainfall events otherwise
Monitor vegetation clearing activities near sensitive areas such as wetlands or drainage lines	Activity log of monitoring actions and any mitigation and avoidance measures implemented	Monthly during the rainy season and following significant rainfall events otherwise
Monitor revegetated and stabilised areas	Record of monitoring site, problems encountered and remedial actions implemented	Monthly during the rainy season and following significant rainfall events otherwise

16.6.2 Operational Phase

The following monitoring actions should be implemented during the operational phase of the development:

Monitoring Action	Indicator	Timeframe
Monitor for the development of new erosion problems across the site, with a focus on areas where water has been diverted or collected from upslope onto downslope areas	Map of erosion problem areas	Quarterly
Document erosion control measures implemented	Records of control measures and their success rate.	Quarterly
Document the extent of erosion at the site and the remedial actions implemented	Decline in erosion and vulnerable bare areas over time	Biannually

17 FIRE MANAGEMENT PLAN

The National Veld and Forest Fires Act states that it is the landowner's responsibility to ensure that the appropriate equipment as well as trained personnel are available to combat fires.

Although fires are not a regular occurrence at the site, fires may occasionally occur under the right circumstances. Ignition risk sources in the area include the following:

- Lightning strikes
- The railway line which runs through the facility
- Personnel within the facility
- Infrastructure such as transmission lines

17.1.1 Firebreaks

Extensive firebreaks are not recommended as a fire risk management strategy at the site. The site is very large compared to the extent of the infrastructure and the maintenance of firebreaks would impose a large management burden on the operation of the facility. In addition, the risk of fires is not distributed equally across the site and within many of the lowlands of the site, there is not sufficient biomass to carry fires and the risk of fires within these areas is very low. Rather targeted risk management should be implemented around vulnerable or sensitive elements of the facility such as substations or other high risk components. Within such areas, the extent over which management action needs to be applied is relatively limited and it is recommended that firebreaks are created by mowing and that burning to create firebreaks is not used as this in itself poses a risk of runaway fires. Where such firebreaks need to be built such as around substations, a strip of vegetation 5 10 m wide can be cleared manually and maintained relatively free of vegetation through manual clearing on an annual basis. However if alien species colonise these areas, more regular clearing should be implemented.

18 FUEL STORAGE MEASURES

18.1 Storage Tanks

The storage tanks will be within contained areas to prevent spills contaminating soil and water, and with a design to capture and contain a volume of spill of at least 110% of the volume of stored fuel. These containers can be built in concrete and painted with anti-corrosive paint. The floor of the container must be inclined to permit the collection of the spilled liquids.

The storage tanks must also have a cover protection on top, prepared for drainage and collection of runoff.

18.2 GENERAL PROCEDURES

- Transport routes for the transport of fuel will be clearly indicated;
- Pollution control equipment (spill and leak cleaning kits) must be readily available;
- Ensure personnel training, including: measures to prevent fuel spills, to treat/clean fuel spills, how to react on spill of flammable liquids on clothing and in the inhalation of vapours, leaks simulations; fuel vapour recovery processes, etc. Keep records of all training;
- Maintain the premises and equipment in a clean and tidy state;
- Regularly clean outdoor areas with a broom;
- Wastewater from outside areas must be directed to the contaminated water drainage system, and not enter the storm water system;

- Used oils (waste oil) will be collected, re-used, stored and disposed of in line with disposal procedures for hazardous wastes;
- Ensure the proper management of other hazardous wastes (contaminated soils, used spilling kits, waste lube, etc).

FILLING OPERATIONS

- Isolate the area by cones and a rope;
- Prohibit refuelling operations during tank filling operations;
- Avoiding having people who are not involved in the operation within a 10 metre radius;
- Prohibit smoking and the use of mobile telephones or any other ignition sources during tank filling operations or vehicle refuelling, within a 3 metre radius;
- Use a tight-fill cap to completely seal off the connections between the tubing and the truck's and station's tanks;
- Engines must be turned off during refuelling;
- Prevent overflowing and spilling situations when the storage tanks are being filled (verify filling sensors and be aware of overflow alarms).

Preventing Accidents with fuel mixtures

- Establish a procedure to deal with the potential occurrence of these situations, such as:
- The chemicals and reaction mechanisms associated with the substances mixed or blended must be well understood and documented
- Chemical and process hazards must be understood and addressed and the facilities should ensure that process equipment, controls, and procedures are designed, installed and maintained to safely operate the process
- All employees should understand the chemical and process hazards
- Facilities should establish a system for Standard Operating Procedures and ensure that they are understood and followed
- Display clear and informative messages for users of the station, as to how to deal with this situation;
- Prepare a procedure to suitably dispose of wastes recovered from the batches of fuel mixture.

Spill Kits

- Emergency spill kits of absorbent material (e.g. sand) must be provided and stored next to the higher risk sites, and must be easily-accessible, ideally outside, in order to allow an immediate response when a spill occurs. This will be clearly labelled and ready for use.
- Drums for the storage of contaminated material must be provided.
- An accurate drawing of the local drainage system shall be posted next to the spill kit.

Closure Phase

- During the closure phase, there may be loss of product into the soil, as a result of a deliberate or accidental release during closure and removal of tanks and tubing. In addition, this risk may arise outside of the facility site, if the tanks and/or tubing are not properly disposed of.
- In the closure phase, it is important to remove all tanks and pipes. A risk may arise if the tanks are left on site with residual products. As the integrity of the equipment will no longer be ensured or monitored.
- During closure, it must be ensured that facilities do not present a risk to the environment, health or safety. Measures must be taken to ensure that the closure does not result in an unacceptable risk, including:

- Any and all waste products will be removed from the tanks. Care will be taken to ensure that no product is lost into the soil. Tank closure must be carried out safely, with the removal of explosive vapours, for example by filling the tanks with water or inert gases. All tanks will be safe prior to their removal from the ground. Similar methods will be employed prior to the removal of the pipes.
- Water used in this process will be contaminated with residual product, and thus a water contamination risk may arise if the contaminated water is not disposed of in a way which is appropriate for hydrocarbon contamination. This would normally imply the removal to a suitable waste handling facility.
- According to best environmental practices, the tanks, tubing and distributors will be disposed of. However, if the tanks remain in situ, it will be ensured that the procedure is safe. After making the tanks inert and safe, they will be filled in with sand, concrete, inert mud or hydrophobic foam.
- The tanks and associated tubing which are no longer considered appropriate or safe for fuel storage will not be used for storage of other hydrocarbons, without first ensuring their integrity.
- The oil/water separators will be removed for disposal, off the facility site. Otherwise they will be filled in a similar way to the tanks. Regardless of the fate of the oil/water separator, all liquid and mud waste will be removed (off the facility site) and all the inlets and outlets will be sealed.
- Whatever drainage system left behind will be modified to ensure that it does not serve as a path for pollutants to reach groundwater or other waters.
- If the deactivation is temporary, product can be left in the tanks. In this case, all monitoring procedures will be carried out as if the facility were in operation. If for any reason the monitoring cannot carry on, the tanks will be emptied and made inert.
- Personnel involved in the closure of a filling and fuel station will be aware and respect obligations with regards to waste disposal, in line with the best practices described above.

Environmental Aspect	**Action or Measure**
Prevent accidental spills from entering the stormwater drainage system	Provide cleaning equipment conceived specifically to deal with minor spills as may occur at the station. Place a clearly-identified spill kit in a visible location for each fuelling line.
	Develop a step-by-step guide to use of the spill kit.
	Develop an evacuation plan and/or response procedures for emergencies involving large fuel spills.
	Train the whole team in the emergency response procedures. Make sure that all staff knows where the emergency equipment is to be found and is acquainted with its maintenance.
	Label all of the stormwater drains on site in the proximity of the facilities as "Clean Water Only".
	Inspect the fuel distribution area in order to confirm that rainwater drained or emptied from the roof doesn't enter the areas marked out.
	Check whether the embankment around the fuel distribution area is in good condition and has the capacity to contain a fuel leak in the event of an emergency.

Environmental Aspect	Action or Measure
Minimise the risks of environmental contamination and from issues of workers' health and safety	Provide training to the staff regarding the disposal of material contaminated with fuel, such as absorbent material from the spill kit, soaked in fuel.
	Ensure that the product safety cards for all fuels and oils are up-to-date and accessible at all times.
Minimise the risks of fuel leaks as may result in pollution of the sub-soil and groundwater	Check if there is fuel, from a possible leak, in the spill containment sumps installed at the tank's discharge nozzle.
	Check if there is fuel, from a possible leak, in the all tanks containment sumps, installed on the manhole to the storage tanks. In the event of suspected leakage, report it immediately.
	Check if there is fuel or lube, from a possible leak in the containment sumps installed under the tanks.
Minimise the risks of fuel leaks as this may result in pollution of the sub-soil and groundwater	Check if there is fuel, from a possible leak, in the chambers of the containment sumps installed under the pumps
Minimise the risks of harmful emissions to the atmosphere and the loss of fuel	Check that lids, flanges and connections are closed.
	Confirm that the ventilation conduits are not blocked.
	Supervise the fuel deliveries.
Minimise the risks of water pollution	Carry out an Oil-Water Separator inspection to ensure effective treatment.
Integrity control	Adequate maintenance and calibration of the monitoring equipment

19 DECOMMISSIONING PHASE

Should the WEF be decommissioned a decommissioning plan must be produced. The plan must include details on the decommissioning and dismantling of the WEF, taking in consideration the potential environmental impact associated with it. Environmental monitoring plans must be produced so ensure no pollution occurs during this phase. The plan must include the steps that will be taken to rehabilitate the area after the WEF is dismantled, as well as recycling options of the equipment and structures.

20 CONCLUSION

In terms of the National Environmental Management Act 107 of 1998 everyone is required to take reasonable measures to ensure that they do not pollute the environment. Reasonable measures include informing and educating employees about the environmental risks of their work and training them to operate in an environmentally acceptable manner.

Furthermore, in terms of the 'Act', the cost to repair any environmental damage shall be borne by the person responsible for the damage.

It is therefore imperative that the management plan is successfully implemented, as a failure to comply could have legal implications.

The environmental impacts on the site will not be significant if the construction management is well implemented, and a set of operational guidelines are developed by the long term site management body.

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REVISED FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED UMSINDE EMOYENI WIND ENERGY FACILITY

PHASE TWO

APPENDIX C: DEA REJECTION LETTER AND MINUTES OF MEETING

WESTERN AND NORTHEN CAPE PROVINCES

DEA REF: 14/12/16/3/3/2/687

On behalf of
EMOYENI WIND FARM PROJECT (PTY) LTD

February 2018

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

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Tel (012) 310 3911

DEA Reference: 14/12/16/3/3/2/684, 685, 686 and 687
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PER EMAIL / MAIL

Dear Ms Bodasing

REJECTION OF THE ENVIRONMENTAL IMPACT ASSESSMENT REPORTS FOR THE PROPOSED UMSINDE EMOYENI WIND ENERGY FACILITY PHASE 1 AND PHASE 2 AND ITS ASSOCIATED ELECTRICAL GRID CONNECTION PHASE 1 AND PHASE 2, WESTERN AND NORTHERN CAPE PROVINCE

The Environmental Impact Assessment Reports (EIArs) received on 20 April 2016 and receipt of the reports as acknowledged on 11 May 2016 for the abovementioned activity, submitted in terms of the requirement of the Environmental Impact Assessment (EIA) Regulations 2010, the letter dated 15 July 2017 indicating the concern expressed by Mr A van der Spuy and the correspondence dated 24 August 2017 informing Mr Van der Spuy of the outcome of the investigation, refer.

Following a review of the amended application form and the EIArs received on 20 April 2016, this Department rejects the EIArs in accordance with Regulation 34(1)(a) of the EIA Regulations, 2010.

In terms of Regulation 56(2) of the EIA Regulations, 2010 before the EAP managing an application for environmental authorisation submits a final report compiled in terms of these Regulations to the competent authority, the EAP must give registered I&APs access to, and an opportunity to comment on the report in writing. However, after review of the abovementioned documents it was found that the EAP did not comply with the above provision and had submitted the reports to the Department and I&APs at the same time (20/04/2016).

This Department therefore requests the following:

a) The EAP must ensure that the assessment of impacts, the environmental impact assessment process and the requirements of the public participation process (PPP) is conducted in accordance with Regulations 54 to 57 of GN R. 543 of the EIA Regulations, 2010.
b) The EAP must ensure that all concerns raised in the EIA process have been adequately addressed in the final EIArs. In particular, the concerns from BirdLife SA and any other I&AP that had an objection especially with regard to avifauna.
c) The EIArs must meet the requirements of the acceptance of the SR letter, this rejection letter and the requirements of Regulation 31 of the EIA Regulations, 2010.

d) The following information must form part of the EIArs as well as a separate document for ease of reference:
   - An amended application form with an indication of all the 2010 listed activities that are still listed and this must specify the relevant sub listed activities;
   - An indication of all the similarly listed 2014 activities and this must specify the relevant sub listed activities;
   - An indication if there are any new 2014 activities that are listed;
   - An indication where in the report all the 2014 activities have been assessed and mitigated for; and
   - A letter/affidavit from the EAP indicating that the above is true and correct.

e) 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.

f) The final EIArs must include a comments and response report as per the requirements of the Regulations.

g) The EAP must provide the exact comment provided by a specific interested and affected party in the comments and response report and address the respective comment before moving to the next comment. The EAP should not generalise and categorise the comments raised by I&APs.

h) The final EIArs must include all responses made by the EAP to the representations, comments and views raised by I&APs.

Copies of the final EIArs must be circulated to all key stakeholders, Organs of State and registered I&APs for a duration of 30 days for comment. The issues raised by I&APs must be addressed in a table format indicating the issue/concern raised and the EAP's response thereto and must include copies of the I&APs' correspondence as well as a copy of this Department's rejection letter.

The EAP must provide proof that all registered I&APs have been notified of the availability of the final EIArs. On receipt of the abovementioned information, this Department will reconsider the report in accordance with Regulation 30(1) of the EIA Regulations, 2010.

This Department further advises that according to Regulation 67 of the EIA Regulations, 2010, an application in terms of the EIA Regulations lapses if the applicant after having submitted the application fails for a period of six (06) months to comply with a requirement in terms of the EIA Regulations relating to the consideration of the application. As such, the final EIArs must be submitted to this Department within six (06) months of the date of this correspondence.

Please note that the activities applied for may not commence prior to an Environmental Authorisation being granted by this Department. You are hereby reminded of Section 24F of the National Environmental Management Act, Act No. 107 of 1998, as amended, that no activity may commence prior to an Environmental Authorisation being granted by the Department.

Should you have any queries or wish to discuss the points raised above, please do not hesitate to contact the writer.

Yours faithfully

Mr Sabelo Malaza
Chief Director: Integrated Environmental Authorisations
Department of Environmental Affairs
Signed by: Mr Coenrad Agenbach
Designation: Deputy Director: Strategic Infrastructure Developments
Date: 05/09/2017

cc:	Peter Venn	Emoyeni Wind Farm Project (Pty) Ltd	Email: peter.venn@windlab.com
	Kobus Munro	WC Department of Environmental Affairs and Development Planning	Email: Kobus.munro@westerncape.gov.za
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Meeting with the Department of Environmental Affairs

Discussion on Rejection letter for the Environmental Impact Assessment Reports for the Proposed Umsinde Emoyeni Wind Energy Facility, Phase 1 and Phase 2 and Its Associated Electrical Grid Connection Phase 1 and Phase 2, Western and Northern Cape Province"

DEA Reference 14/12/16/3/3/2/684/685/686/687

Minutes and Actions

Date: 10 October 2017
Venue: DEA Offices Pretoria
Attendees: see attached attendance register
Agenda: see attached

Issue	Comments	Actions
Introduction	CA introduced himself and thanked everyone for attending. He highlighted the emergency procedure, should there be an evacuation. CA asked all attendees to introduce themselves (see attached attendance register).	
Legal Representation	Windlab, the applicant, attended the meeting with legal representation. The DEA stated that they had no legal representation at the meeting and will respond to any legal matters, should it be required, after the meeting and after consultation with their legal department.	No actions, as there were no legal responses required by the DEA.
Regulation 56 (2) Compliance	The EAP asked the DEA for the reasoning behind their assertion that the regulation had not been complied with.	
	MS responded by saying that according to the regulations, interested and affected parties (I&APs) must be afforded the opportunity to review and comment on the Final EIA Reports before submission to the DEA.	
	Although in many instances, I&APs were notified prior to the submission of the report to the DEA, it was done on the same day and the DEA, see this as the non-compliance with the regulation. It was agreed that the regulations does not specify the number of day "before" but that 30 days would be considered a reasonable amount of time to comment on the FEIAr.	
	Windlab's legal representative (MD) stated that from a legal perspective. Definition of "before" – is preceding the act. No time is stipulated as to how long before submission of the FEIR access should be	

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	given to the report. The spirit of the regulations, and public participation is not entirely about notification, it is about access to the report. Standard practice, in compliance with public participation, is about access to information for I&APs to review and comment. The timeline of events around the submission of the Final EIA Reports, indicate that the courier picked up the reports on the 19th of April 2017 and on 20th of April, notifications were sent out to I&APs, and at 11.05 on the 20th the Report was received by the DEA. The FEIR was also delivered to government departments, libraries and municipalities on the 20th. The exact time of delivery was not stipulated on the receipts. There is synchronicity, but in some instances the notifications were delivered from a few minutes to some hours after receipt of acceptance by DEA. The intent of the regulations is to promote access and participation. DEA took 503 days to respond to and accept or reject the reports, I&APs had this time to submit comments on the report. DEA approved the process that was followed during the draft phase and the purpose of the final report, is to ensure that all comments and concerns on the final report are included and responded to. Difficult to see what prejudice there has been to I&APs, in this process, as they were afforded the opportunity to comment on the final reports.	
	KP: Since the DEA have no legal representation at this meeting, they do not have to respond to this, if they feel they need a legal response.	
	MS acknowledge that there are gaps in the regulations, number of days are not stipulated. MS asked HA and MSh, for clarification of the main reason for the rejection of the report. A way forward is required.	
Reason for Rejection of Reports	HA stated that a letter was sent out (date) stating that the project is on hold, until the DEA responds to Andre van der Spuy's (AVDS) objection letter. Based on the department's response to AVDS and his comments the report was rejected.	
	CA stated that lengthy comments received by the department were investigated. . Of all the concerns raised, procedural issues were the main concern for the department. The DEA felt that should this project be appealed, it is likely that the appeal would be successful on procedural grounds in regard to Reg 56 (2). The EIAr was therefore rejected as 56(2) was not followed. Clarity was requested on the way forward and it was communicated by DEA that the rejection letter allows the EAP to make the final EIA Reports available to I&APs for a period of 30 days. Comments will still go to the DEA and the EAP copied. The EAP will collate all comments and submit this together with the revised final report to the DEA for authorisation.	

Grouping of Comments	KP asked for clarity regarding the grouping of comments. AB read out the points (f), (g) and (h) as per the letter of rejection.	
	HA stated that these are general comments, to ensure that the revised final report is compliant with the regulations, and that the report is not rejected on this basis. If the issues trail complies with these points, then it will not need to change. The issues and response report will not need to be reworked.	
	MS stated that the EAP needs to ensure that all issues are responded to and indicate clearly where in the report, if required, it has been dealt with. It is not sufficient to say "noted" as a response.	
	HA stated that avifauna, was picked up as a main concern regarding the project, and the EAP must ensure that all concerns raised are dealt with adequately in the final EIA Reports.	
F Draft EIA or Final EIA Report	AB asked if the report that goes out for public review is the draft report or the final EIA Report.	
	The DEA confirmed that the report will be the Revised Final Report with the requested changes that will be released for the commenting period.	
	AB asked if there are changes to the report, will the report go back to draft and following the public participation as outlined in the plan of study and conduct public participation as contemplated therein.	
	The department confirmed that if there are any changes to the report, the report will still be the Revised Final Report, and will be renamed as "amended" or "revised" final report. The department confirmed that the final report has already been submitted and therefore the report cannot go back to draft.	
	AB/ LW asked the department to confirm, if there are substantial changes, and change to the project description, what will the status of the report be and what public participation will be required.	
	The department confirmed that any changes to the report, even substantial the report will still be the Revised Final Report, renamed "amended" or "revised" final report. The department further confirmed that the additional 30 day public review and comment period, required as a condition in the rejection letter is sufficient public participation and the requirement of public meeting and focus group meeting is not necessary. HA: any new information needs to be made available to I&APs for public participation.	
	AB/LW asked if the comments received during the 30 day commenting period need to be responded to by the EAP, and responses sent to the specific I&AP that commented.	
	The department confirmed the responses to comments received is not required, as this commenting period is on the final report, and as per the regulations, all comments on final reports, must be sent directly to the	

	DEA, with the EAP copied in. The department did request that the EAP collate all comments received, in a separate document, and an addendum to the comments and response report to be forwarded to the department at the end of the 30 day commenting period. The EAP should also advise in this document how the EAP would have responded to the query / comment and where in the report, it has been addressed, if the comment had been received previously. Any new issues raised by I&APs during this 30 day commenting period will be dealt with by the department in their review process of the application.	
Rejection Letter Requirements	KP asked if the specific requirements contained in the rejection letter is as a result of noncompliance in the final reports submitted to the DEA.	
	The DEA confirmed that these are standard requirements that need to be included in final revised report, to ensure compliance with the Regulations.	
	AB asked if the application form needs to be included as part of the EIA reports, and asked for confirmation regarding point (d) of the rejection letter.	
	The department confirmed that the application form does not need to be included in the EIA Reports. they further confirmed that the following needs to form a separate document to be submitted with the amended application form: Point d of the rejection letter, sub bullets (see attached letter of rejection).	
Comments Post Submission of Final Report in April 2016	AB asked if comments received after the submission of the final report, in April 2016 need to be included in the issues trail	
	The department confirmed that they need to be included and responded to in the issues trail but not directly responded to the I&AP that submitted the comment.	
Request for additional time	AB asked if the 6 months allowed for in the letter and Regulation 67 of the 2010 EIA regulation can be extended	
	The department confirmed that a request can be made to the department asking for additional time. This will be assessed according to its merits.	
Appeals Process	LW asked under which regulations will the appeals process follow	
	MS confirmed that appeals will be dealt with as contemplated under the 2010 regulations.	
Submission Requirements	The department confirmed that this rejection letter must form part of the final EIA reports, and a table must be included upfront indicating where in the report this specific request has been addressed.	

	The department further confirmed that 5 copies of the final reports do not need to be submitted. They have requested two electronic copies and one hard copy to be submitted.	
Minutes of the Meeting	The Department did not indicate/confirm that minutes of this meeting must not be included in the final report for public review. However, the Department indicated that Interested and Affected Parties might request the minutes of this meeting.	EAP will for transparency include the minutes of the meeting in the Revised FEIA Report to be submitted for public review.
End of meeting	CA thank everyone for attending and closed the meeting at 11.30.	

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Projects: **Umsinde Emoyeni Wind Energy Facility Phases 1 & 2 & Grid Connection, Western and Northern Cape Provinces – Environmental Impact Assessment**

DEA Ref: 14/12/16/3/3/2/684, 14/12/16/3/32/685, 14/12/16/3/3/2/686, 14/12/16/3/32/687

Type: Meeting with the Department of Environmental Affairs

Date: 10 October 2017

Time: 10am – 11am

Location: DEA Environment House, Pretoria

Attendees: DEA Representatives, EAP and Public Participation Representatives, Applicant Representatives, legal counsel (applicant).

Agenda:

1. **Introductions**
2. **Umsinde Emoyeni WEFs and Grid Connection**

- Regulation 56 (2) Compliance
- Content of Rejection Letter - Point by point
- EIA Process (2010 or Resubmission under 2014)
- Discussion and Way forward:

- Submission of Draft report with changed scope.
- New application, scoping and EIA under 2014 Regulations.

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

MEETING: UMSINDE EMOYENI WIND ENERGY FACILITY AND ASSOCIATED INFRASTRUCTURE
VENUE: DEA offices, Pretoria
DATE: 10/10/2017
TIME: 10:00am

No.	Name & surname	Organisation	Tel Number	Email	Signature
1.	Mahlatse Shubane	DEA	0123999417	mshubane@environment.gov.za	
2.	Herman Alberts	DEA	012 3999371	HAlberts@environment.gov.za	
3.	Liam Whitlow	EIMS/Arcus	0117897170	liam@eims.co.za	
4.	Katherine Persson	Windlab	021 701 1292	katherine.persson@windlab.com	
5.	Marguerite Davis	Young Earth	010 900 4882	mdavis@youngearthattorneys.com	
6.	Ben Brimble	WL	083 646 9091	ben.brimble@windlab.com	
7	Coenrad Agenbach	DEA	012 399 9407	cagenbach@environment.gov.za	
8.	Ashlin Bodasing	Arcus	021 4121524	ashlinb@arcusconsulting.co.za	
9.	Millicent Solomons	DEA	012 399 9382	MSolomons@environment.gov.za	
10.					
11.					
12.					

ARCUS

REVISED FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED UMSINDE EMOYENI WIND ENERGY FACILITY

PHASE TWO

APPENDIX D: DEA RESPONSE TO ANDRE VAN DER SPUY

WESTERN AND NORTHEN CAPE PROVINCES

DEA REF: 14/12/16/3/3/2/687

On behalf of
EMOYENI WIND FARM PROJECT (PTY) LTD

February 2018

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X 447· PRETORIA · 0001· Environment House · 473 Steve Biko, Arcadia· PRETORIA
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DEA Reference: 14/12/16/3/3/2/684/685/686 & 687
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Mr André van der Spuy
André van der Spuy Environmental Consultants
42 Afrikander Road
SIMON'S TOWN
Cape Town
7975

Telephone Number: (021) 786 2919
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Dear Mr Van der Spuy

RE: NOTIFICATION OF PROCEDURAL FLAWS, OBJECTION THERETO AND CALL TO THE DEPARTMENT OF ENVIRONMENTAL AFFAIRS FOR RESTORATION OF CORRECT ORDER WITH REFERENCE TO THE PROPOSED UMSINDE EMOYENI WIND ENERGY FACILITIES AND ASSOCIATED GRID INFRASTRUCTURE, WESTERN AND NORTHERN CAPE PROVINCES

Your letter dated 19 May 2016 to Ms Ngcaba, Director General of the Department of Environmental Affairs and the Department's acknowledgement letter dated 14 July 2016, refer. The Department would like to respond as follows:

1. **AVDS letter to the Director General of Environmental Affairs (dated 15/03/2016): Failure of the competent authority to respond and to restore the rights of our clients.**

1.1. The original email correspondence dated 15/3/2016 and the attached letter dated 06/03/2016 were never received by the Directorate: Strategic Infrastructure Developments of the Department. However, the Department has reviewed the scoping reports and found that it adhere to the requirements of the 2010 EIA Regulations hence accepting these reports on 30/04/2015. The Department cannot therefor "totally reverse the process".

All I&APs had another opportunity to participate in the process with the opportunity to comment on the draft environmental impacts assessment reports (EIArs) within the timeframe provided. In addition, the comment period on the draft EIArs were extended (e-mail 19/02/2016) until 07/03/2016 to give I&APs additional time to comment. I&APs have also an opportunity to submit their comments on the final EIArs to the Department.

1.2. Refer to point 1.1 above. In addition, the Department notes that you are acting on behalf of the following parties:

- Mr. Frans Harvoor & Others
- Badsfontein Country Guesthouse and Farm (Mr. Izak van de Merwe)
- Ratelfontein Private Game Reserve (Mr. Jan Pickard)

Is it then not your responsibility to inform, liaise and solicit comments from these parties? It cannot reasonably be expected that the EAP must still individually solicit comments from these parties who you represent. Mr Frans Harvoor and other parties have an opportunity to comment in the EIA phase.

2. Inclusion and submission of draft information of a material nature to the Department.

2.1. The Department has not yet accepted the final EIArs and will take this issue into consideration when reviewing the final EIArs.

2.2. The Department is satisfied that all the requirements of the EIA process were met and I&APs were given a fair opportunity to comment on all reports up to and including the draft EIArs. As indicated above, the Department has not taken a decision on the final EIArs. In making the decision on the acceptability of the final EIArs, it will determine if all legal requirements were adhered to.

2.3. The Department agrees that the comments relating to the final EIArs are required to be submitted to the Department (and a copy submitted to the EAP) in terms of the 2010 EIA Regulations. As indicated above, no decision has been taken on the final EIArs and the Department will consider the applicable legal requirements in such decision.

The public consultation process is however not an open ended process. Comments on the final EIArs must be submitted to the Department and copied to the EAP. There is no provision in the Regulations for another comments and response cycle.

2.4. The EAP must submit the final EIArs to the Department after taking into account any issues raised on the draft version (as is required in the Regulations). As already indicated, the EIA process is not an open ended process with continues comment-and-response cycles. The EIA Regulations are clear on the steps and opportunities for I&APs to participate in and to comment on reports. I&APs have an opportunity to verify minutes, issues raised etc. in the review of final EIArs and submit comments on these reports to the Department and copied to the EAP. There is no provision in the regulations for the EAP to respond to the comments submitted by I&APs on the final EIArs.

2.5. Please see above response. Your letter did not indicate the substantive issues that you raised during your comment on the draft EIArs. The Department will verify that all comments on the draft EIArs have been adequately dealt with in the final EIArs and the comments and responses reports.

2.6. It is correctly stated that Regulation 56(4) refers to draft reports. However, the Department is satisfied that I&APs have had a fair and reasonable opportunity to comment on the draft reports. The Department therefore considers the submitted final EIArs, to be final reports. Whether the requirements, regarding the submission of the final EIArs in terms of the EIA Regulations, 2010 have been met, will be determined with the review of these reports.

2.7. Please see response under 2.4. In terms of Regulation 56, the Department will take this into consideration when reviewing the final EIArs. Please note that there is "no approach adopted by the EAP and the Department" and "the Department's apparently acceptance" of the final EIArs is incorrect.

3. Draft stakeholder meeting minutes: Failure by the EAP to uphold agreed to procedures of review and subsequent dishonest representation of same (and other critical information)

3.1. According to the EAP, the minutes of the focus group meeting held on 04/02/2016 were sent on 01/04/2016 for your review and comment, but the EAP has not received any comments back. The final reports were submitted to the Department on 20/04/2016, therefore it seems that you had a reasonable amount of time to submit comments. I&APs had an opportunity to review minutes, issues raised etc., during the comment period on the draft EIArs and have so on the final EIArs.

3.2. Please see response under 3.1.

3.3. The EAP indicated that the minutes of the meeting held on 04/02/2016 were sent to you on 01/04/2016 for your review and comment but no comments were received to date (proof of email is included in the report). The EAP further denied that there was such condition agreed upon. The Department is not in a position to confirm if there was an agreement reached between the EAP and yourself that the minutes must be approved before finalising the final EIArs. The Department will consider all requirements in terms of the 2010 EIA Regulations when reviewing the final EIArs.

3.4. The Department has reviewed the scoping reports and found that these adhere to the requirements of the 2010 EIA Regulations hence accepting these reports on 30/04/2015. The Department cannot reconsider its decisions taken on these reports. The Department is of the opinion that all reasonable measures were taken to notify I&APs of the project and to solicit comments. As indicated previously, it is expected that you should inform and obtain comments from your clients. The Department will consider all comments in reviewing the final EIArs.

4. Draft public meeting minutes: Failure by the EAP to uphold accepted procedures of review and dishonest representation of the same

4.1. The Department already responded to the above allegation under point 3.2.

4.2. The Department is not in a position to confirm what was presented at the meeting. Page 40 to 43 of the final Scoping Report received by the Department on 10/02/2015 and accepted on 30/04/2015 included a full description of the site selection process followed. It is stated that a prefeasibility assessment was undertaken as part of the site selection process, and the Umsinde site during the pre-feasibility assessment was found to have no fatal environmental flaws. The presentation made by the applicant was included in Volume II. The response from the EAP seems to be reasonable.

5. Lack of answers by EAP to formal enquiries and requests submitted on 5 April 2016

5.1. It was established that the designated commenting period on the draft EIArs commenced on 15/01/2016 and lasted until 24/02/2016. This period was extended until 07/03/2016. Your enquiry was submitted on 05/04/2016 and follow-up enquiries were also sent via email (on dates of 10/5/2016, 12/5/2016 and 18/5/2016) when the commenting period has already closed. The Department is of the opinion that you had a reasonable opportunity to submit your comments in the 50 days provided. The consultative process is not an open ended process but have start and end phases to ensure that the process come to a conclusion.

5.2. Please refer to response 5.1. The EAP indicated that it did respond to your email on 19/05/2016. You were however unhappy with the response. The Department will consider the response when decisions on the acceptability of the final EIArs are made.

5.3. Neither the National Environmental Management Act, 1998 (Act No. 107 of 1998) ("the NEMA") nor the EIA Regulations of 2010, require that the viewpoints of I&APs must be heard directly from the affected individual and not through a representative. However, in the case where legal issues emerge, and there is no proof that the representative acted on behalf of the clients, the representative may be held personally liable in legal proceedings.

5.4. The necessary documentation was submitted to the Department. This was included in the application forms submitted as part of the final EIArs and include the commissioner of oaths forms and the declarations of independence. This can be found in Appendix A of the final EIArs.

5.5. The Department takes into consideration all the legal requirements of the Regulations when making in-process and final decisions (EA) and will consider your allegations when reviewing the final EIArs. The Department rejects your claim that it colludes with the applicant and EAP in the strongest sense and you are advised to submit evidence to substantiate this very serious allegation.

6. Request for site meeting at AVDS clients affected properties, operations and premises prior to a final decision by the DEA on the subject applications

6.1. The Department accepted the final SRs on 30/04/2015. It was satisfied that all legal requirements were met. At this stage in the EIA process, the Department must consider the final EIArs and all the legal requirements pertaining thereto. It is also unclear as to what are the true facts and real extent of the environmental and socio-economic impacts which are grossly misrepresented by the EAP. Again, as stated above, your claims regarding a conspiracy will be ignored unless supported by evidence.

6.2. The Department advise that in terms of Regulation 16 (1) *before conducting basic assessment or S&EIR, an applicant must appoint an EAP at own cost to manage the application*. In addition, regulation 56 (1) states that *a registered interested and affected party is entitled to comment, in writing, on all written submissions, including draft reports made to the competent authority by the applicant or the EAP managing an application, and to bring to the attention of the competent authority any issues which that party believes may be of significance to the consideration of the application*.

In terms of Section 1 of the Act:

***competent authority"**, means that in respect of a listed activity or specified activity, means the organ of state charged by this Act with evaluating the environmental impact of that activity and, where appropriate, with granting or refusing an environmental authorisation in respect of that activity.*

In addition, this Department advises that, the definition of an EAP as defined in the EIA Regulations, 2014 *"means an environmental assessment practitioner as defined in section 1 of the Act."*

In terms of Chapter 1 of the Act:

***"environmental assessment practitioner"**, when used in Chapter 5, means the individual responsible for the planning, management and coordination of environmental impact assessments, strategic environmental assessments, environmental management plans or any other appropriate environmental instruments introduced through regulations;"*

In light of the definitions above as well as regulation 16(1) and 56(1), the responsibility of the competent authority is to evaluate the EIA applications and the EAP is to plan, manage and co-ordinate environmental impact assessments and the registered I&APs to provide comments. It is therefore not the role of the Department to "meet with I&APs and visit their properties and places of abode".

7. Notification of reserved right to submit comments on legitimate final EIArs after restoration of procedural correctness

7.1. Noted. As indicated above, the Department has not taken a decision on the acceptability of the final EIArs. The Department will take the legal requirements into consideration when reviewing the reports.

7.2. Please refer to response under point 2.4. I&APs have the opportunity to comment on the final EIArs and submit their comments to the Department and copied to the EAP. There is not another round of "response" by the EAP or Department to these comments. The Department will take all comments into consideration when making a decision on the application.

7.3. Noted. The Department will recommence with reviewing the final EIArs. Once a decision has been made, you will be notified by the EAP of the decision.

7.4. There is no legislated timeframe for the submission of comments to the Department on final reports by I&APs. In general the Department allows for a 30 day commenting period which is regarded as reasonable.

Should you have any queries or wish to discuss the points raised above, please do not hesitate to contact the writer whose details are specified at the top of this letter.

Yours faithfully

M Solomons

Mr Sabelo Malaza
Chief Director: Integrated Environmental Authorisations
Department of Environmental Affairs
Letter Signed by: Ms Milicent Solomons
Designation: Director: Strategic Infrastructure Developments
Date: 24/08/2017.

cc	Mr Peter Venn	Emoyeni Wind Farm Project	Email: peter.venn@windlab.com
	Ms Jennifer Slack	Arcus Renewable Energy Consulting Ltd	Email: JenniferS@arcusconsulting.co.za