ARCUS

PROPOSED PAULPUTS WIND ENERGY FACILITY AND ASSOCIATED GRID CONNECTION, NORTHERN CAPE PROVINCE

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

On behalf of

PAULPUTS WIND ENERGY FACILITY (RF) PTY LTD

AUGUST 2019

DEA Reference No.: 14/12/16/3/3/2/1120

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PROJECT DETAILS

DEA Reference Number:	14/12/16/3/3/2/1120
Arcus Reference No:	3073 Paulputs WEF EIA
Title:	Environmental Impact Assessment Report for the Proposed Paulputs Wind Energy Facility and Associated Grid Connection
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Project Applicant:	Paulputs Wind Energy Facility (RF) (Pty) Ltd
Report Status:	Final Environmental Impact Assessment Report

This final report is available for public review at the following locations:

- www.arcusconsulting.co.za
- Khai-Ma Local Municipality, Pofadder
- Kakamas Public Library, Kakamas

Changes made from Draft to Final EIA Report	**Section**
Date changed to August 2019.	Volume I: Section 1 to 14
Typographical and formatting corrections.	Volume I: Section 1 to 14
Table H: Development Area Geographic Coordinates - Paulputs WEF Final Mitigated Layout Turbine Locations added	Volume I: Table H
Updated Table 1.1: Comments received from the DEA on the Final Scoping Report and the Draft EIA Report.	Volume I: Section 1
Section 4: Public Participation Process was updated to reflect process completed to date and summary of issues raised.	Volume I: Section 4
Section 6.3: Design Evolution Alternatives added.	Volume I: Section 6.3
Flora and Fauna Impact Assessment - guidelines for Monitoring Programme for *Aloidendron dichotomum* provided, information on site sensitivity and listed plant species added, DENC site visit comment extracts added.	Volume I: Section 8.4 Volume I: Appendix B: EMPr Volume III: Flora and Fauna Impact Assessment
Avifauna Impact Assessment - Operational mitigation measures updated to provide pylon specifications.	Volume I: Section 10.4 Volume I: Appendix B: EMPr Volume III: Avifauna Impact Assessment
Bat Impact Assessment - Operational mitigation measures updated to include curtailment plan if thresholds triggered.	Volume I: Section 10.5 Volume I: Appendix B: EMPr Volume III: Bat Impact Assessment
Noise Impact Assessment - Operational mitigation measures updated to include noise monitoring at closest residential dwelling.	Volume I: Section 10.6 Volume I: Appendix B: EMPr Volume III: Noise Impact Assessment
Conditions to be Included in Environmental Authorisation - Ecology, Bats, Noise and Heritage updated.	Volume I: Section 12
Table 13 - Periods Recommended for Inclusion in the Environmental Authorisation added.	Volume I: Section 13
The word draft was removed throughout the EMPr where applicable.	Volume I: Appendix B: EMPr
Typographical and grammatical errors were corrected and minor clarifications were made throughout the EMPr.	Volume I: Appendix B: EMPr
The Comments & Responses Report was updated to present the PPP conducted to date, as well as all comments received and responses given.	Volume II: Comments & Responses Report

EXECUTIVE SUMMARY

Introduction

Paulputs Wind Energy Facility (RF) (Pty) Ltd are applying for environmental authorisation to construct the Paulputs 300 MW wind energy facility (WEF) and its associated infrastructure, including a 132 kV grid connection (the proposed development). Arcus Consultancy Services South Africa (Pty) Ltd ('Arcus') has been appointed by Paulputs Wind Energy Facility (RF) (Pty) Ltd to act as the independent environmental impact assessment practitioner (EAP) to undertake the environmental impact assessment (EIA) process for Environmental Authorisation under Chapter 5 of the National Environmental Management Act, 1998 (Act 107 of 1998 - NEMA) as amended, for the Proposed Development.

Site Location and Proposed Development Description

The proposed Paulputs WEF is located approximately 50 km (centre point of the site) northeast of Pofadder and approximately 80 km northwest of Kakamas in the Northern Cape Province. The proposed Paulputs WEF is situated in two district municipalities, the Namakwa District Municipality and the ZF Mgcawu District Municipality, and within the Khâi-Ma Local Municipality and the Kai !Garib Local Municipality.

The proposed development will consist of a maximum of 75 wind turbines generators, each with a maximum hub height of 140 m (maximum blade tip height 230 m). The blade length will be a maximum of 90 m and a maximum of 180 m for the rotor diameter.

The proposed development aims to generate and distribute electricity from renewable wind energy resource into the national grid by connecting the onsite switching station(s) with 132 kV overhead powerlines to the existing Eskom Paulputs Substation or the existing 132 kV overhead powerline. Three overhead powerline route options are proposed from the onsite switching station Option A to the existing Eskom Paulputs Substation or the existing 132 kV overhead powerline. Overhead powerline Options A and B are approximately 19.6 km in length, while overhead powerline Option C is approximately 12.5 km. Internal reticulation between onsite substation Option A and Option C is approximately 6.5 km of overhead powerlines, assessed as a 300 m wide corridor by the specialists.

Only one of the three main grid connection options will be utilised, and a portion of the line connecting the substation options depending on which proposed substation location(s) are chosen. Specialists assessed all proposed grid connection options as 300 m corridors, and all options are being applied for. Servitude area assessed by the specialists, took into account the worst case scenario, i.e. longest possible 31 m wide servitude of approximately 26.8 km - grid connection Option B with internal reticulation between on-site substations added.

A Final Scoping Report (FSR) was submitted to the Department of Environmental Affairs (DEA) and accepted in May 2019. The FSR presented and assessed the initial proposed wind turbine layout and associated infrastructures. The results of the specialists' assessments as well as other technical and financial constraints for this proposed site were taken into consideration and a revised preferred layout was produced, which is presented and assessed in this Environmental Impact Assessment Report (EIAr). Following these specialists' assessments and their proposed mitigation measures a mitigated layout was produced (Figure 7.1 Proposed Site Development Plan).

Environmental Legislative Requirements

The EIA Regulations 2014 published in Government Notice (GN) No. R. 982 as amended provide for the control of certain Listed Activities. These activities are listed in GN No. R. 983 (Listing Notice 1 - Basic Assessment), R. 984 (Listing Notice 2 - Scoping & EIA Process) and R. 985 (Listing Notice 3 - Basic Assessment) of 4 December, and are prohibited to proceed until environmental authorisation has been obtained from the competent authority, in this case, the Department of Environmental Affairs (DEA).

As the proposed Paulputs WEF and Grid Connection development triggers Listed Activities in Listing Notices 1 - 3, a full Scoping and EIA process will be followed for this application.

Listed Activities applicable to the proposed Paulputs WEF and Grid Connection are presented in the table below. All potential impacts associated with these Listed Activities will be considered and assessed in this EIA.

Applicable Listed Activities in terms of the NEMA

LISTING NOTICE	ACTIVITIES
LN 1 GN R327[1]	11(i); 12 (ii, a, c); 14; 19 (i); 24 (ii); 28 (ii); 48 (ii, a, c), 56 (i, ii).
LN 2 GN R325[2]	1 & 15.
LN 3 GN R324[3]	4 (g)(ii)(ee); 12(g)(ii)(ee); 14(ii, a, c)(g)(ii)(ff); 18(g)(ii)(ee); 23(ii, a, c)(g)(ii)(ee)

Depending on the final design of the Paulputs WEF and Grid Connection, there may be a requirement for the following additional permits / authorisations:

- Waste Management License/s as required by the NEMA, Waste Act, 2008 (Act No. 59 of 2008);
- Mining Permits as required by the Minerals and Petroleum Resources Development Act, 2002 (MPRDA) (Act No. 28 of 2002)(MPRDA); and
- Water Use Licenses as required by the National Water Act, 1998 (Act No. 36 of 1998) (NWA).

These permits will be applied for should the project be authorised and be selected as a preferred bidder.

Result of Specialist Investigations

Geology, Soils and Agriculture

The proposed development is located on land zoned and used for agriculture (grazing). South Africa has very limited arable land and it is therefore critical to ensure that development does not lead to an inappropriate loss of potentially arable land. The assessment has found that the proposed development will only impact agricultural land which is of low agricultural potential and only suitable for grazing.

Due to the low agricultural potential of the site, and the consequent low agricultural impact, there are no restrictions relating to agriculture which preclude authorisation of the proposed development and therefore, from an agricultural impact point of view, the development should be authorised.

Geotechnical Study

Based on geological and geotechnical information obtained for Paulputs and interpretation thereof, there appears to be no geotechnical reason for the wind farm development not to proceed.

[1] "Listing Notice 1 of the EIA Regulations, promulgated under Government Notice R983 of 4 December 2014, as amended by Government Notice R327 of 7 April 2017."
[2] "Listing Notice 2 of the EIA Regulations, promulgated under Government Notice R984 of 4 December 2014, as amended by Government Notice R325 of 7 April 2017."
[3] "Listing Notice 3 of the EIA Regulations, promulgated under Government Notice R985 of 4 December 2014, as amended by Government Notice R324 of 7 April 2017."

Aquatic

The proposed layout of the facility would seem to have limited impact on the aquatic environment as the proposed structures have avoided the delineated watercourses and only the internal road and underground cable network will require water course crossings.

Thus, based on the findings of this study no objection to the authorisation of any of the proposed activities inclusive of the alternatives is made at this point.

Therefore, based on the site visit the significance of the impacts assessed for the aquatic systems after mitigation would be LOW.

The final number of actual water course crossings can be determined when micro-siting occurs, but presently 67 crossings have been identified that would trigger the need for a Water Use License application (WULA) (a potential General Application [GA]) in terms of Section 21 c and i of the National Water Act (Act 36 of 1998) (NWA), should any construction take place within these areas. Should any of the present road crossings need to be upgraded then the opportunity exists to improve the current state (lack of habitat continuity) for example by replacing pipe culverts with box culverts. This opportunity to improve the hydrological conditions can be seen as a net benefit and has been assessed as part of the cumulative impact statement.

Flora and Terrestrial Fauna

The whole Paulputs WEF site is located within the Bushmanland Arid Grassland vegetation type, which is an extensive vegetation type considered to be generally low sensitivity with a low abundance of species of concern. The resolution of national vegetation map is however coarse in the study area and there are several different vegetation communities and habitats present in the area which have not been mapped. In order to address this shortcoming a more detailed habitat map for the site was developed based on the results of the field assessment. Of particular relevance is the presence is numerous washed as well as several rocky outcrops which are considered sensitive and largely unsuitable for development. These features however occupy a small proportion of the site and do not pose a significant limitation for the development of the site as a wind farm. Under the final layout assessed, there would not be a direct impact on the rocky outcrops, and there are no turbines within the washes. In terms of the limits of acceptable change within the different sensitivity categories provided for the development, the final development footprint is well within these limits and as such no limits of acceptable change have been exceeded by the development.

The abundance of listed fauna in the area is low and there while there are some habitats present that are considered to be of high faunal value, these occupy a small proportion of the site and have been avoided. Long term impacts on fauna are likely to be low and restricted to some habitat loss and operational phase disturbance as a result of the presence and operation of the wind farm. A part of the site is located within a CBA 1, which raises the suitability of development within this part of the site into question. Correspondence with DENC indicates that this area has been identified as a CBA based on the presence of *Aloidendron dichotomum* within the site. This species was confirmed present at the site at a low density, both within and outside of the area demarcated as a CBA. With the appropriate avoidance, direct impact on this species can be well-mitigated.

Although the development would result in some habitat loss across the site, this is not likely to affect the local population of *Aloidendron dichotomum*. A more direct threat would likely be poaching and harvesting of young trees by construction or operational phase personnel on the site. Specific mitigation should be implemented during construction and operation to reduce this risk, including setting up and implementing a long-term population monitoring programme within the site for this species. Overall, provided that impact on *Aloidendron dichotomum* can be avoided, then development within the CBA area is considered acceptable from an ecological stand point. However, as this area still contributes to meeting targets, represents habitat for *Aloidendron dichotomum* and is currently in a moderate condition, the overall extent of the development footprint in this area should be limited to ensure that its ecological function is not compromised. The final development footprint within the CBA is estimated at 15 ha which is within the recommended 20 ha footprint limit provided to the developer for this area and as such is considered acceptable.

Avifauna

Activity and abundance of priority species and red data species were found to be very low to low on the proposed Paulputs development site. The diversity of these species recorded was also low. Abundances and diversity of small passerines was found to be low as well. Verreaux's Eagle were confirmed breeding 1.8 km outside of the WEF site boundary and > 3 km from the nearest proposed turbine, however the species was not recorded flying on site. The WEF site does not contain any important Verreaux's Eagle habitat, even though they may traverse the site or forage there occasionally. A 3 km buffer was implemented surrounding the nest site, in which no turbines may be placed.

Compared to other WEF sites flight activity of priority species was the lowest recorded on any WEF that the specialists have worked on or are aware of. Therefore the WEF site itself appears to be well suited for wind energy development from an avifaunal perspective. The associated grid connection however does have the potential to negatively impact certain species, particularly Ludwig's Bustard. This impact is partially mitigatable and considered acceptable when all mitigations have been applied. The shortest grid connection alternative is the preferred alternative from an avifaunal perspective, and therefore using Substation Option A, together with the grid connection connecting to the existing 132 kV line is preferred. However, all options are acceptable, if correctly mitigated.

The proposed layout was found to be acceptable as no turbines are proposed in areas of high avifaunal sensitivity. The remainder of the site is considered to be of low avifaunal sensitivity. All mitigation measures listed must be included in the EMPr or as a condition of the EA. From an avifaunal perspective, the project is acceptable and can be authorised.

Bats

Bat activity at the proposed Paulputs WEF is mostly low to moderate but was either high or very high in February, August and October. Therefore, the significance ratings for the majority of the impacts to bats posed by the development are predicted to be low or medium before mitigation. After mitigation, all impacts (besides cumulative impacts) are predicted to be low. Impacts related to bat mortality, and cumulative impacts, are predicted to be of high consequence, and high significance before mitigation. After mitigation these impact are predicted to be of medium consequence, and low significance for bat mortality, and low significance for cumulative impacts.

The mitigation measures are related to the design of the proposed WEF and associated grid connections and avoiding the placement of turbines in areas that bats are most active based on the pre-construction monitoring data. The current turbine layout adheres to the bat sensitivity map, with no blades intruding into bat buffers. Additional mitigation measures that must be considered are the choice of turbine model. The minimum distance between the blades and the ground must be maximised. Monitoring of bat activity and bat fatality during the operational phase of the WEF is needed to determine if any additional mitigation measures are needed. Attention must be given to bat fatality levels during operation of the facility which should be assessed relative to threshold levels. Mitigation options may include using deterrents or an operational minimization strategy (i.e. curtailment) during specific seasons and time periods for specific turbines coincident with periods of increased bat activity and fatality. It is likely that residual impacts to bats will be greater in February, August and October as this is when bat activity was high. The curtailment plan should be revised based on additional bat activity and bat fatality data collected during the operational phase of the project.

The bat monitoring data collected and analysed suggest that the development of the Paulputs WEF can be achieved without unacceptable risks to bats. In addition, based on the layout assessed in this report, all turbines currently adhere to the sensitivity buffers.

Noise

Whilst construction noise impacts are no more than Low significance, the noise management measures detailed below are recommended in the interest of best practice during construction operations:

- Construction activities should be limited to times agreed with the local municipalities;
- Deliveries of turbine components, plant and materials by HGV to site should only take place by designated routes and within times agreed with the relevant authorities;
- The site contractors should employ the best practicable means of reducing noise emissions from plant, machinery and construction activities, as described in BS 5228;
- Where practicable, the work programme should be phased, which would help to reduce the combined effects arising from construction operations;
- Where practicable, noise from fixed plant and equipment should be contained within suitable acoustic enclosures or behind acoustic screens;
- Where practicable, night time working should not be carried out. Local residents should be notified in advance of any potentially noisy night-time construction activities; and
- Any plant and equipment normally required for operation at night (19:00 - 07:00), e.g., generators, should be suitably screened or located such that noise levels from the plant do not exceed 45 dB, L_{Aeq} at the nearest noise-sensitive receptors.

Operational noise mitigation was embedded in the development during the design and Scoping stages, through maximising the distance from the wind turbines to the noise-sensitive developments. Potential impacts of no more than Low intensity were identified for the operation of the development; no further mitigation is therefore required.

Noise due to the construction and operation of the proposed development has been determined at the closest, and therefore most noise-sensitive developments, in accordance with internationally recognised methodologies.

The predicted noise levels have then been assessed against a number of criteria incorporating South African and international guidance. The worst-case level of impact was found to be Low at the closest noise-sensitive development, with no impacts anticipated for more distant noise-sensitive developments.

No significant impacts are therefore anticipated due to the proposed development, and as such, it is the opinion of the author that the proposed development may be authorised.

It is recommended that a condition is attached to the permission for the proposed development, requiring that noise due to the operation of the proposed development is not to exceed 45 dBA, $L_{Feq,8hr}$ at any residential dwelling present at the time of this consent.

In addition to the above, it is also recommended that a condition is attached requiring operational noise monitoring to be undertaken at the closest residential dwelling (H3), within 6 months of the development being fully commissioned. In the event that the development is found to exceed the noise limit specified above, the operator should implement a noise abatement programme in consultation with a suitably qualified Acoustics Consultant, and a further measurement undertaken to determine compliance. This cycle should continue until it can be demonstrated that the development is operating within its specified noise limit.

Heritage, Archaeology and Palaeontology

The assessment finds that numerous Stone Age archaeological resources occur throughout the WEF study area but that they are generally associated with water sources and rocky hills. The sensitive locations are all in the northern part of the WEF site. These are areas typically protected from development for various reasons and impacts to these heritage resources are not expected. The same applies to the power line routes, although these were not physically examined. There is still a small chance that isolated water holes with associated archaeological sites can be located in open areas but these could only be identified once a final road layout is available and surveyed.

The landscape is more natural than cultural but will experience visual impacts. The important part of this is that the N14 is considered a route of cultural significance and aesthetic value because of the qualities of the landscape through which it passes. Turbines would be placed on both sides of the road meaning that motorists would have to pass through the development. The power lines and substation, on the other hand, present a far more limited impact and, if the wind farm is constructed then the associated power line would have a negligible further impact. Despite the WEF straddling the road, and considering the benefits to the economy, the impacts to the N14 and surrounding landscape are not significant enough to be a fatal flaw, largely because the turbines would be in a cluster and not spread out over a lengthy section of the road in what is a very extensive landscape.

It is best practice to avoid all significant heritage sites but, if this is not possible, mitigation can still be effected if necessary.

It is recommended that a pre-construction archaeological survey be carried out within the authorised footprint in order to identify any residual issues and recommend mitigation as may be required.

It remains possible, that rare, isolated bones might be present and could be damaged or destroyed during construction activities. Mitigation would involve protecting and reporting any fossils that are found so that they can be examined and collected (if necessary) by a palaeontologist.

Because impacts of high significance are not expected to occur, it is recommended that the proposed WEF, power line and associated infrastructure (including all three substation locations) can be authorised.

Visual

An EIA level visual study was conducted to assess the magnitude and significance of the visual impacts associated with the development of the proposed Paulputs WEF and associated grid connection infrastructure near Pofadder in the Northern Cape Province. Overall, sparse human habitation and the predominance of natural vegetation cover across much of the study area would give the viewer the general impression of a largely natural setting with some pastoral elements. As such, WEF development would alter the visual character and contrast significantly with the typical land use and/or pattern and form of human elements present across the broader study area. The level of contrast will however be reduced by the presence of the KaXu, !Xina and Konkoonies SEFs, the Paulputs substation and the existing high voltage power lines in close proximity to the Paulputs WEF application site.

The area is not typically valued for its tourism significance and there is limited human habitation resulting in relatively few potentially sensitive receptors in the area. The proposed WEF development will have a high level of impact on three (3) of these receptors, and a moderate level of impact on thirteen (13) identified receptors. The proposed 132kV power line and substation will have a moderate impact on eleven (11) potentially sensitive receptors.

During operation, visual impacts from the WEF would be of moderate significance with relatively few mitigation measures available to reduce the visual impact. Visual impacts associated with the WEF on-site infrastructure and the grid connection infrastructure during operation would be of low significance.

Areas of visual sensitivity have been taken into account in the turbine layout and although several turbines (T4, T5, T9, T14, T52, T63 and T71) are very close to the 500 m buffer on the N14, none of these turbines are actually inside the demarcated exclusion zone.

Although other renewable energy developments and infrastructure projects, either proposed or in operation, were identified within a 35 km radius of the Paulputs WEF application site, it was determined that only eleven of these would have any significant impact on the landscape within the visual assessment zone. All eleven projects are SEFs and three are already in operation. These projects are concentrated in close proximity to Paulputs Substation and the surrounding landscape has already undergone noticeable change. This concentration of facilities will alter the inherent sense of place and introduce an increasingly industrial character into a largely rural area. This will result in significant cumulative impacts, rated as medium during both construction and operation phases of the project. It is however anticipated that these impacts could be mitigated to acceptable levels with the implementation of the recommendations and mitigation measures stipulated for each of these developments by the visual specialists.

Three (3) substation site options and four (4) power lines route options were assessed as part of the EIA. All of these options are included in the EA application and as such they are not alternatives. All options were however assessed from a visual perspective and no fatal flaws were identified for any of the substation sites or power line route options.

The visual impacts associated with the proposed Paulputs WEF development and associated grid connection infrastructure are of moderate significance. Given the low level of human habitation and the absence of sensitive receptors, the project is deemed acceptable from a visual perspective and the EA should be granted. The impacts associated with the construction, operation and decommissioning phases of the project can be mitigated to acceptable levels provided the recommended mitigation measures are implemented.

Social

The findings of this Social Impact Assessment (SIA) conducted for the proposed Paulputs WEF indicates that during the construction and the operational phase of the proposed development project, various employment opportunities, with different levels of skills will be created. In addition this will also create local business opportunities benefitting the socio-economic development of the local communities of Pofadder and Kakamas. The local communities will however benefit from the establishment of a Community Trust if it is managed effectively. The challenges posed by climate change and global warming will be addressed by the investment in renewable energy facilities like the proposed Paulputs WEF.

The establishment of the proposed Paulputs WEF is therefore supported by the findings of this SIA report and therefore, also creating a positive social benefit for society.

Traffic and Transportation

The proposed Paulputs WEF is expected to be built over a period of 24 months (and the grid is also expected to be built over a period of 24 months). The WEF and grid builds would run concurrently and is not expected to generate significant traffic volumes on the road network.

Some vehicles associated with the WEF build are particularly large and these super-load vehicles would be affected by constraints as identified (and possibly other constraints not identified) en-route from Saldanha Port to site.

A Traffic Management Plan must be prepared to reduce limit traffic congestion and to enhance road safety, in light of the additional traffic due to the associated WEF; and to ensure safe site access and a Transport Management Plan must be prepared to address transport of abnormal super-load and abnormal load vehicles to and on-site.

The construction of the Paulputs Wind Energy Project and various other solar PV energy projects planned within 35 km from the site could coincide with the Paulputs WEF and grid construction. The cumulative traffic is not significant considering the road network capacity in the vicinity of the site, but abnormal load and particularly super-load transportation from Saldanha Port should preferably be co-ordinated to limit impact (delay of traffic) on the road network where possible.

Taking the above findings into consideration it can be concluded that the development of the Paulputs WEF and grid and associated infrastructure will not have undue detrimental impact on traffic and that identified impacts can be suitable mitigated. It is the reasoned opinion of the specialist that the development of the Paulputs WEF (and grid) can be approved, from a traffic and transport engineering perspective, subject to the specific requirements / mitigation measures included in the specialist report.

Conclusion

The proposed Paulputs WEF and Grid Connection 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 level. 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 readily available, technically viable and commercially cost-effective sources of renewable energy.

The impacts of the proposed development need to be viewed in the context of the country's energy mix and the negative externalities associated with the current dominant energy source of coal, often in areas of high potential soils, such as the Eastern Highveld, and the pollution that this form of energy generates. With this comparison in mind the impact of a wind energy facility is minimal compared to the damaging impacts of coal mining and coal-fired power generation. Indeed, wind energy is associated with positive externalities in the form of Economic Development benefits and the cheaper 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 agricultural potential plays a more significant role and in the role of externalities associated with power production.

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.

Operational phase monitoring of birds and bats that must be undertaken according to applicable guidelines current at the start of the operational phase will contribute to scientific knowledge regarding the impacts of wind farms on birds and bats. The information collected during the operational monitoring should be shared with BirdLife SA and the Endangered Wildlife Trust, 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).

Should the Paulputs WEF and Grid Connection be developed, the actual physical footprint of the wind turbines and associated infrastructure will occupy an area of land equivalent to approximately 2 % of the total project area. 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.

The EIA has concluded that no negative potential impacts identified and assessed by the specialists remain high significance with mitigation, including potential cumulative impacts associated with the proposed development. Potential negative impacts that remain medium significance after mitigation were identified by the ecology, bird, heritage, visual, social and traffic specialists while potential positive impacts of high significance after enhancement were identified by the social specialist.

The negative impacts associated with the proposed Paulputs WEF and Grid Connection are considered acceptable by the specialists, provided that all recommendations and mitigations are 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 layout of the facility, 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 there are potential negative environmental impacts associated with the proposed development, the extent of the positive benefits associated with the implementation of the project in terms of renewable energy supply and positive local and regional economic impact are considered to outweigh the negative impacts.

DEPARTMENT OF ENVIRONMENTAL AFFAIRS INFORMATION REQUIREMENTS FOR WIND FARM APPLICATIONS

The Department of Environmental Affairs' requirements for information for all applications for Wind Energy Facilities (WEFs) are included in this section of the report. Where this information is not provided in the tables below, the location of where it can be found in the report is indicated.

Table A: DEA Information Requirements – Wind Energy Facility and Grid Connection General Site Information

Description	Report Reference				
Descriptions of all affected farm portions	**Property owner**		**Farm name and Portion**	**Size in hectare**	**21 digit Surveyor General codes**
	WEF	Izak Jacobus Martinhus van den Heever	Scuitklip 92/2	6066.31	C03600000000009200002
		Flores Johannes van der Colff	Scuitklip 92/3	948.99	C03600000000009200003
			Scuitklip 92/5	1573,06	C03600000000009200005
			Lucasvlei 93/1	3193.78	C03600000000009300001
			Lucasvlei 93/2	2895.08	C03600000000009300002
		Maria Margareta Clasina Straus	Lucasvlei 93/4	2895.36	C03600000000009300004
	Grid Connection Options A and B	T G N BOERDERY TRUST (Gerhard Visser)	Scuit-klip 92/RE	5447.91	C03600000000009200000
			Gemsbok Vlakte 140/1	2607.09	C03600000000014000001
		NICOLAAS MICHIEL BRAND	Konkoonsies 91/1	5040.02	C03600000000009100001
		KAXU C S P SOUTH AFRICA PTY LTD	Scuit-klip 92/4	3507.63	C03600000000009200004
		KONKOONSIES TRUST (Fanie vd Heever)	Konkoonsies 91/6	1713.12	C03600000000009100006
			Scuit-klip 92/1	3507.64	C03600000000009200001
	Grid Connection Option C	Izak Jacobus Martinhus van den Heever	Scuitklip 92/2	6066.31	C03600000000009200002
Copies of deeds of all affected farm portions	Submitted with application form				
Photos of areas that give a visual perspective of all parts of the site	Volume III: Visual Impact Assessment Report				
Photographs from sensitive visual receptors (tourism routes, tourism facilities, etc.)	Volume III: Visual Impact Assessment Report				

Description	**Report Reference**
Type of technology	Onshore Wind Turbine electricity generators
Structure height (Tip Height)	Maximum of 230 m
Surface area to be covered (including associated infrastructure such as roads)	Typical of wind energy facilities, the amount of surface area covered by turbines and associated infrastructure such as roads is approximately 2 % of the total site area.
Structure orientation	Conventional three bladed horizontal axis wind turbine generator mounted on a single vertical tower structure.
Laydown area dimensions (Construction period and Operation)	Permanent laydown area and the temporary construction laydown area will both be approximately up to 1 hectare each, contained within the three 4 ha substation compounds.
Generation capacity of the facility as a whole at delivery points	75 Turbines x 4 MW per turbine = 300 MW Maximum Generation Capacity

Table B: DEA Information Requirements - WEF Technical Details

Component	**Description/Dimensions**
Location of the site	50 km northeast of Pofadder, Northern Cape Province
Facility Area	The proposed development site is approximately 10 000 hectares. This is the total area covered, in which all components will be located. The actual development footprint will be approximately 2 % of this.
Number of Turbines	Up to 75
Site Access	N14 (NW and SE access - including abnormal loads) and MN759 (NW access only - no abnormal loads)
Hub Height from ground level	Up to 140 m
Blade Length	Up to 90 m
Rotor Diameter	Up to 180 m
Area occupied by inverter transformer stations/substations	Three substation compounds were assessed covering approximately 4 hectares each, maximum 12 hectares.
Capacity of on-site substation	132 kV

Component	Description/Dimensions
Area occupied by both permanent and construction laydown areas	It is assumed that the permanent laydown area and the temporary construction laydown will form part of the 200 m x 200 m substation compound. Battery technology may be stored in storage containers adjacent to the substation itself, probably in the 1 hectare area that will be the temporary laydown during construction. The three substation compounds are 4 hectares each to allow for a 1.1 hectare substation, 0.5 hectare office block, 1 hectare permanent laydown and 1 hectare temporary laydown.
Operations and maintenance buildings (O&M building) with parking area	The O&M complex will form part of the 200 m x 200 m substation compound.
Length of internal roads	Approximately 80 km
Width of internal roads	Maximum 12 m (mostly 6 m wide but up to 12 m, average 8 m) Area occupied by internal roads approximately 80 km x 8 m = 64 hectares
Proximity to grid connection	Approximately 13 - 20 km from onsite switching stations
Height of fencing	Up to 3 m around substations and buildings
Type of fencing	Stock proof palisade and/or diamond mesh (around substation)

Table C: DEA Information Requirements - Grid Connection Technical Details

Component	Description/Dimensions
Height of pylons	Maximum of 30 m high
Length of transmission line	Approximately 26.8 km - longest proposed Grid Connection Option B from the on-site substation compound Option A to the existing Eskom Paulputs substation + on-site reticulation from on-site substation Option A to Option C. Only one grid connection will be developed however all options were assessed and are being applied for. Three substation compounds are proposed.
Type of poles used	Both monopoles and lattice structures are being considered at this point.
Area occupied by pylon servitude	Width 31 m x 26.8 km = 83 hectares (worst case scenario)
Transmission capacity	132 kV line, evacuating a maximum of 300 MW.
Area occupied by both permanent and construction laydown areas	Laydown areas used are the same as for the WEF
Area occupied by buildings	The O&M complex will form part of the on-site 200 m x 200 m substation compound.
Length of service road	26.8 km (worst case scenario)
Width of service road	3 - 6 m wide
Proximity to grid connection	13 - 20 km

Height of fencing	Maximum 3 m only around on-site substation and buildings
Type of fencing	Wired mesh / chain link fence not electrified

Table D: DEA Information Requirements - Site Maps and GIS Information

Site Maps and GIS Information	Section of this Report
All maps/information layers are provided in ESRI Shapefile format.	
All affected farm portions must be indicated.	Figure 7.1
The exact site of the application must be indicated (the areas that will be occupied by the application).	Figure 1.1
A *status quo* map/layer must be provided that includes the following: Current use of land on the site including:	
Buildings and other structures	Figure 7.3
Agricultural fields	Figure 7.3
Grazing areas	Figure 7.3
Natural vegetation areas (natural veld not cultivated for the preceding 10 years) with an indication of the vegetation quality as well as fine scale mapping in respect of Critical Biodiversity Areas and Ecological Support Areas	Figure 7.3
Critically endangered and endangered vegetation areas that occur on the site	Figure 12.1
Bare areas which may be susceptible to soil erosion	Figure 7.3 The soil specialist found that due to high permeability of the sandy soils and low slope, low rainfall, and rock outcrops the environment does not pose a high water erosion risk. Because of their sandy texture the soils are however susceptible to wind erosion.
Cultural historical sites and elements	None identified
Rivers, streams and water courses	Figure 12.1
Ridgelines and 20 m continuous contours with height references in the GIS database	Figure 7.3
Fountains, boreholes, dams (in-stream as well as off-stream) and reservoirs	Figure 7.3
High potential agricultural areas as defined by the Department of Agriculture, Forestry and Fisheries	None identified

Site Maps and GIS Information	Section of this Report
Buffer zones (also where it is dictated by elements outside the site): **500 m from any irrigated agricultural land** **1 km from residential areas**	Figure 12.1
Indicate isolated residential, tourism facilities on or within 1 km of the site	Figure 7.3
A slope analysis map/layer that include the following slope ranges: **Less than 8% slope (preferred areas for turbines and infrastructure)** **Between 8% and 12% slope (potentially sensitive to turbines and infrastructure) Between 12%and 14% slope (highly sensitive to turbines and infrastructure)** **Steeper than 18% slope (unsuitable for turbines and infrastructure)**	Figure 7.2
A map/layer that indicate locations of birds and bats including roosting and foraging areas	Figure 12.1
A site development proposal map(s)/layer(s) that indicate: **Turbine positions** **Foundation footprint** **Permanent laydown area footprint** **Construction period laydown footprint** **Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible).**	Figure 7.1
River, stream and water crossing of roads and cables indicating the type of bridging structures that will be used.	Not evaluated at this stage. All water crossings identified and mapped in the Aquatic Impact Assessment (Volume II)
Substation(s) and/or transformer(s) sites including their entire footprint.	Figure 7.1
Cable routes and trench dimensions (where they are not along internal roads) Connection routes to the distribution/transmission network (the connection must form part of the EIA even if the construction and maintenance thereof will be done by another entity such as ESKOM).	Figure 7.1 Description of cable routes and trenches provided in Section 7.
Cut and fill areas at turbine sites along roads and at substation/transformer sites indicating the expected volume of each cut and fill	Not evaluated at this stage. This will only be determined if the project is awarded preferred bidder status and a detailed transportation plan is produced.

Site Maps and GIS Information	Section of this Report
Borrow pits	Licensed borrow pits will be used to source material.
Spoil heaps (temporary for topsoil and subsoil and permanently for excess material) Buildings including accommodation	Temporary and permanent spoil heaps will be kept within demarcated construction areas, and monitored by the ECO during the construction phase.

Table E: DEA Information requirements: Regional Map and GIS Information

Regional Map and GIS information	Section of this report
Roads including their types (tarred or gravel) and category (national, provincial, local or private)	Figure 1.1
Railway lines and stations	None identified
Industrial areas	None identified
Harbours and airports	None identified
Electricity transmission and distribution lines and substations	Figure 7.1
Pipelines	None identified
Waters sources to be utilised during the construction and operational phases	None identified
A visibility assessment of the areas from where the facility will be visible	A preliminary viewshed showed that no screening would be provided by the topography and as such the proposed development would be visible from all areas within a 10 km radius of the application site. Accordingly, no viewshed maps have been included in this report.
Critical Biodiversity Areas and Ecological Support Areas	Figure 12.1
Critically Endangered and Endangered vegetation areas	None identified
Agricultural fields	Figure 7.3
Irrigated areas	None identified
An indication of new road or changes and upgrades that must be done to existing roads in order to get equipment onto the site including cut and fill areas and crossings of rivers and streams	This will only be determined if the project is awarded preferred bidder status and a detailed transportation plan is produced.

Table F: Development Area Geographic Coordinates - Paulputs WEF

Reference Point	Latitude (Degrees Seconds Minutes)	Longitude (Degrees Seconds Minutes)
A	28°52′58″S	19°41′30″E
B	28°54′45″S	19°47′05″E
C	28°55′07″S	19°46′53″E
D	28°57′39″S	19°47′57″E
E	29°00′21″S	19°45′06″E
F	28°59′42″S	19°42′00″E
G	28°57′14″S	19°39′29″E

H	28°55'39"S	19°40'44"E

Table G: Development Area Geographic Coordinates - Paulputs WEF Grid Connection

Reference Point	Latitude (Degrees Seconds Minutes)	Longitude (Degrees Seconds Minutes)
Option A&B - Start	28°58'21"S	19°45'33"E
Option A&B - Middle	28°55'58"S	19°37'00"E
Option A&B - End	28°52'52"S	19°33'52"E
Option C - Start	28°58'21"S	19°45'33"E
Option C - Middle	28°53'24"S	19°41'27"E
Option C - End	28°50'45"S	19°41'43"E

Table H: Development Area Geographic Coordinates - Paulputs WEF Final Mitigated Layout Turbine Locations

Turbine Number	Latitude	Longitude	Height above Sea Level (m)
1	28°59'8.01"S	19°41'45.75"E	968
2	28°58'55.28"S	19°42'13.62"E	974
3	28°58'39.42"S	19°41'29.48"E	970
4	28°58'39.27"S	19°42'37.84"E	971
5	28°58'15.17"S	19°43'5.84"E	981
6	28°58'12.82"S	19°41'50.14"E	960
7	28°58'3.60"S	19°41'21.62"E	961
8	28°57'58.69"S	19°42'41.11"E	969
9	28°57'42.18"S	19°43'38.58"E	975
10	28°57'34.21"S	19°41'6.29"E	955
11	28°57'34.08"S	19°42'16.48"E	958
12	28°57'29.60"S	19°41'33.13"E	955
13	28°57'6.39"S	19°40'45.40"E	945
14	28°57'6.77"S	19°44'14.10"E	980
15	28°56'51.36"S	19°40'3.11"E	938
16	28°56'52.73"S	19°43'49.34"E	974
17	28°56'48.36"S	19°41'52.12"E	949
18	28°56'46.25"S	19°42'25.39"E	956
19	28°56'35.34"S	19°43'13.54"E	970
20	28°56'21.98"S	19°41'11.82"E	940
21	28°56'14.16"S	19°44'33.21"E	968
22	28°56'11.44"S	19°42'37.82"E	960
23	28°56'8.93"S	19°43'55.41"E	959
24	28°56'7.99"S	19°45'8.37"E	964
25	28°55'58.94"S	19°42'4.74"E	947
26	28°55'57.06"S	19°41'37.98"E	940
27	28°55'54.78"S	19°43'19.58"E	959
28	28°55'46.25"S	19°41'12.27"E	938
29	28°55'36.55"S	19°42'41.02"E	948
30	28°55'29.35"S	19°44'18.97"E	952

31	28°55'29.21"S	19°45'30.99"E	947
32	28°55'23.19"S	19°44'55.05"E	948
33	28°55'21.34"S	19°43'5.21"E	947
34	28°55'16.83"S	19°42'18.19"E	940
35	28°55'4.35"S	19°41'46.95"E	929
36	28°54'48.90"S	19°46'3.78"E	937
37	28°54'44.90"S	19°44'42.59"E	934
38	28°54'29.39"S	19°41'43.70"E	918
39	28°54'24.98"S	19°43'57.60"E	928
40	28°54'7.39"S	19°43'0.59"E	918
41	29° 0'8.32"S	19°44'59.02"E	1010
42	28°59'58.14"S	19°44'12.02"E	998
43	28°59'45.38"S	19°44'38.04"E	1007
44	28°59'40.76"S	19°43'38.05"E	988
45	28°59'41.81"S	19°45'30.75"E	1009
46	28°59'33.70"S	19°42'39.01"E	963
47	28°59'33.14"S	19°43'5.81"E	972
48	28°59'24.74"S	19°44'2.26"E	993
49	28°59'16.46"S	19°45'11.65"E	1008
50	28°59'1.43"S	19°45'56.17"E	998
51	28°59'0.63"S	19°44'29.35"E	998
52	28°58'55.85"S	19°43'12.73"E	979
53	28°58'44.63"S	19°46'24.08"E	989
54	28°58'38.28"S	19°43'45.28"E	988
55	28°58'38.22"S	19°45'4.72"E	996
56	28°58'33.66"S	19°44'12.12"E	988
57	28°58'25.45"S	19°45'29.81"E	999
58	28°58'26.20"S	19°46'51.09"E	982
59	28°58'17.65"S	19°46'4.08"E	988
60	28°58'3.21"S	19°44'55.90"E	996
61	28°57'57.18"S	19°47'15.44"E	980
62	28°57'45.67"S	19°45'31.21"E	986
63	28°57'39.43"S	19°44'32.18"E	989
64	28°57'40.71"S	19°46'50.69"E	979
65	28°57'40.34"S	19°47'39.65"E	977
66	28°57'25.63"S	19°46'0.08"E	978
67	28°57'6.46"S	19°46'36.32"E	969
68	28°57'2.49"S	19°45'16.95"E	980
69	28°56'55.54"S	19°47'25.39"E	968
70	28°56'43.91"S	19°46'56.90"E	962
71	28°56'33.44"S	19°45'38.53"E	967
72	28°56'29.71"S	19°46'14.59"E	966
73	28°56'11.51"S	19°47'7.44"E	958
74	28°55'58.97"S	19°46'27.88"E	959
75	28°55'28.30"S	19°46'49.48"E	956

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1 INTRODUCTION

Arcus Consultancy Services South Africa (Pty) Ltd ('Arcus') has been appointed by Paulputs Wind Energy Facility (RF) (Pty) Ltd (PWEF - the Applicant) to act as the independent environmental impact assessment practitioner (EAP) to undertake the environmental impact assessment (EIA) process for Environmental Authorisation under Chapter 5 of the National Environmental Management Act, 1998 (Act 107 of 1998 - NEMA) as amended, for the Proposed Development.

Paulputs Wind Energy Facility (RF) Pty Ltd is proposing the development of the Paulputs Wind Energy Facility (WEF) and associated 132 kV grid connection (the development) on a site approximately 50 km north east of Pofadder in the Northern Cape Province (Figure 1.1).

The proposed Paulputs WEF and grid connection aims to generate and distribute electricity from renewable wind energy source into the national grid by connecting the on-site switching station(s) with 132 kV overhead power lines to the existing Eskom Paulputs Substation located approximately 20 km northwest of site.

1.1 Aim and Purpose of this Report

The purpose of the EIAR is to present the environmental impact assessment undertaken on the preferred alternative for the proposed development. The preferred site layout, and technical specifications were assessed by the specialists and their findings and assessment are collated in this EIAR.

1.2 DEA Requirements

In May 2019, the DEA accepted the FSR for the proposed development, included in the acceptance letter was a list of requirements to be undertaken for the EIA phase. The DEA also submitted comments on the Draft EIA Report, during the public review and comment period. Volume II contains the original comments as received.

Table 1.1 below summarises the comments received from the DEA on the FSR and the Draft EIA Report. This table further indicates where in this report the comments have been addressed.

Table 1.1: Comments received from the DEA on the Final Scoping Report and the Draft EIA Report

No.	Comment from DEA	EAP Response	Section in Report
Final Scoping Report Comments and Responses			
1.	All comments and recommendations made by all stakeholders and Interested and Affected Parties (I&APs) in the draft SR and submitted as part of the final SR must be taken into consideration when preparing an Environmental Impact Assessment report (EIAr) in respect of the proposed development.	All comments and recommendations by stakeholders and I&APs have been addressed and considered and form part of the Comments and Responses Trail	Volume II: Public Participation Report
2.	All mitigation measures and recommendations in the specialist studies are addressed and included in the final EIAr and Environmental Management Programme (EMPr).	All mitigation measures have been included in the EIAr and the EMPr	Sections 10 - 12 App B: EMPr
3.	Ensure that comments from all relevant stakeholders are submitted to the Department with the final EIAr.	Copies of all comments received are included in the Comments and Responses Trail	Volume II: Public Participation Report
4.	Address all issues raised by Organs of State and I&APs prior to the submission of the EIAr to the Department.	All issues raised have been collated in the Comments and Responses trail and responded to. Copies of all correspondence is included in the Public Participation Report.	Volume II: Public Participation Report
5.	Proof of correspondence with the various stakeholders must be included in the EIAr. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments.	Proof of all correspondence including sent emails, delivery notifications and read receipts as well as registered mail are included.	Volume II: Public Participation Report
6.	The EAP must, in order to give effect to Regulation 8, give registered I&APs access to, and an opportunity to comment on the report in writing within 30 days before submitting the final EIAr to the Department.	All I&APs will be given an opportunity to comment on the EIA report for a period of 30 days. All comments received will be included and responded to prior to submission of the final EIAr to the DEA.	Proof of 30 day PPP to be provided in Final EIA Report Volume II: Public Participation Report

No.	Comment from DEA	EAP Response	Section in Report
7.	The EIAr must provide an assessment of the impacts and mitigation measures for each of the listed activities applied for.	All specialists have assessed the proposed project in relation to the listed activities applied for and provided mitigation measures.	Sections 10 - 12 App B: EMPr
8.	The listed activities represented in the EIAr and the application form must be the same and correct.	The correct listed activities are supplied in the EIAr and amended application form submitted with the EIAr.	Section 2, Table 2.1: Listed activities applied for Application Form
9.	The EIAr must assess the correct sub listed activity for each listed activity applied for. The EAP must remove any sub-listed activities that are not listed from the application form and assessment reports.	The correct sub-listed activities are supplied in the EIAr and amended application form submitted with the EIAr. EAP has removed sub-listed activities that are not applicable from the application form and assessment reports.	Section 2, Table 2.1: Listed activities applied for Application Form
10.	The EAP must provide landowner consent for all farm portions affected by the proposed project, whether the project component is linear or not, i.e. all farm portions where the access road, wind turbines and associated infrastructure is to be located.	The NEMA EIA Regulations 2014 as amended, as stated by Regulation 39(2)(a), do not require landowner consent for linear activities. The EAP was unable to obtain landowner consent for all grid connection option affected properties. Grid connection landowner consents that were obtainable are provided with the application form. Landowner consent for all properties affected by the WEF is provided with the application form.	Application Form Appendix 3

No.	Comment from DEA	EAP Response	Section in Report
11.	The EIAr must provide the technical details for the proposed facility in a table format as well as their description and/or dimensions. A sample for the minimum information required is listed under point 2 of the EIA information required for wind energy facilities below.	Technical details for the proposed facility as well their description and/or dimensions are provided in the DEA table format in the EIAr.	Table B: DEA Information Requirements - WEF Technical Details, and Table C: DEA Information Requirements - Grid Connection Technical Details Section 1.4, Table 1.2 WEF and Grid Technical Details
12.	The EIAr must provide the four corner coordinate points for the proposed development site (note that if the site has numerous bend points, at each bend point coordinates must be provided) as well as the start, middle and end point of all linear activities.	Bend point coordinates of the WEF site boundary; and start, middle, end coordinates of the grid connection options are provided in the EIAr.	Table F: Development Area Geographic Coordinates - Paulputs WEF, Table G: Development Area Geographic Coordinates - Paulputs WEF Grid Connection, and Table H: Development Area Geographic Coordinates - Paulputs WEF Final Mitigated Layout Turbine Locations
13.	The EIAr must provide the following: Clear indication of the envisioned area for the proposed wind energy facility; i.e. placing of wind turbines and all associated infrastructure should be mapped at an appropriate scale.	Figures provided in the EIAr map the envisioned area of the proposed WEF and grid connection including wind turbines and associated infrastructure at an appropriate scale.	Figure 7.1 Proposed Site Development Plan
	Clear description of all associated infrastructure. This description must include, but is not limited to the following: – Powerlines; – Internal roads infrastructure; and; – All supporting onsite infrastructure such as laydown area, guard house and control room etc. – All necessary details regarding all possible locations and sizes of the proposed satellite substation and the main substation.	All associated infrastructure is described in the EIAr. Three proposed substation compounds of 4 ha each, total 12 ha, consisting of onsite substation 1.1 ha, offices 0.5 ha, permanent laydown 1 ha, temporary construction yard (future battery storage) 1 ha.	Figure 7.1 Proposed Site Development Plan Section 7 The Preferred Alternative
14.	The EIAr must include the detail inclusive of the PPP in accordance with Regulation 41 of the EIA Regulations, 2014, as amended.	The PPP is being conducted in accordance with Regulation 41, with evidence supplied.	Volume II: Public Participation Report

No.	Comment from DEA	EAP Response	Section in Report
15.	Details of the future plans for the site and infrastructure after decommissioning in 20-30 years and the possibility of upgrading the proposed infrastructure to more advanced technologies.	After the wind turbines are decommissioned, either: • The site will be rehabilitated; or • Advanced wind turbines will be constructed - these are likely to have higher capacity, meaning either less of them will be required, or that the WEF can have a larger capacity if the local grid can evacuate the power and the national energy demand requires it.	Section 7
16.	A significant amount of materials and equipment will be delivered to the site during the construction phase of the development and will thus have impacts on the environment. The impacts of this activity must be fully identified and assessed. The terms of reference for the Traffic Impact Assessment must be expanded to include the following: – Evaluate the impacts of the proposed development on existing road network and traffic volumes. The study must determine the specific traffic needs during the different phases of implementation, namely wind turbine construction and installation, operation and decommissioning; – Identify the position and suitability of the preferred access road alternative; – Evaluate the roadway capacity of the road network; – Confirm the associated clearances required for the necessary equipment to be transported from the point of delivery to the various sites; – Confirm freight and transport requirements during construction, operation and maintenance; – Propose origins and destinations of equipment; and – Determine (Abnormal) Permit requirements if any.	The Traffic Impact Assessment terms of reference were updated as requested and the TIA provides feedback on the DEA requirements listed here.	Volume III: Traffic Impact Assessment

No.	Comment from DEA	EAP Response	Section in Report
17.	The study area falls potentially within the ambit of the Square Kilometre Array - South Africa. The impacts associated with radio frequency interference on the SKA must form part of the environmental impact assessment if it does. The applicant must liaise with SKA-SA (Dr. Adrian Tiplady) for confirmation and their requirements (Terms of Reference for specialist studies) if required. Should EMI and RFI detailed specialist studies be required, these studies must be completed, and included in the draft EIAr with comments being obtained on these studies from the SKA-SA. All communications and correspondences between the EAP and SKA-SA must be included in the EIAr.	Consultation with SKA-SA was undertaken by the EAP. SKA-SA confirmed via email on 06 June 2019 that no further specialist study (e.g. EMI and RFI) was required for the proposed Paulputs WEF and Grid Connection. All correspondence between the EAP and SKA-SA is included in the EIAr.	Volume II: Public Participation Report
18.	All specialist studies must be undertaken at the most appropriate time, and detailed reasons must be provided for why the study was undertaken during the said period.	All specialist studies include a statement on the timing of the study.	Volume III: Specialist Studies
19.	The EIAr must adhere to all the comments issued by this Department on the draft SR.	All comments provided by the DEA on the Draft Scoping Report have been adhered to.	Volume II: Public Participation Report
20.	The specialist studies must consider, and clearly stipulate the range of hub heights and rotor diameters considered. The EAP is to ensure that all specialists are to assess the same range in their assessments, and mitigation measures for the range between the minimum and maximum heights must be provided.	Hub height and rotor diameter dimensions ranges were assessed by specialists, in particular the Bird and Bat specialists, and dimension-specific mitigation measures were provided by the specialists where applicable.	Volume III: Specialist Studies
21.	The specialist studies to be conducted must provide a detailed description of their methodology, as well as indicate the locations and descriptions of turbines that they have assessed.	Specialist studies provide detailed descriptions of their methodologies, and indicate the assessed turbine positions in figures.	Volume III: Specialist Studies
22.	The specialist studies must also provide a detailed description of all limitations to their studies. It must be also noted that all specialist studies must be conducted in the correct season, and conducting a specialist study in the incorrect season and providing that as a limitation will not be accepted.	Assumptions and limitations are provided by all specialists and collated in the EIAr.	Volume III: Specialist Studies Section 1.7 Assumptions and Limitations

No.	Comment from DEA	EAP Response	Section in Report
23.	Should the appointed specialists specify contradicting recommendations, the EAP must clearly indicate the most reasonable recommendation and substantiate this with defendable reasons; and where necessary, include further expertise advice.	No contradicting specialist recommendations were identified during the assessment process.	Volume III: Specialist Studies
24.	Please note that the Department considers a 'no-go' area, as an area where no development of any infrastructure is allowed; therefore, no development of associated infrastructure including access roads and internal cables is allowed in the 'no-go' areas.	The EAP takes cognisance of the Department's definition of a 'no-go' area and clarity on the specialist definition is provided in the mapping of these areas.	Sections 11 - 13
25.	Should the specialist definition of 'no-go' area differ from the Department's definition; this must be clearly indicated. The specialist must also indicate the 'no-go' area's buffer.	Clarity is provided in the definition and applicability of 'no-go' areas. Specialist constraints and buffers are provided with explanation.	
26.	The EIAr must provide a detailed description of the need and desirability, not only providing motivation on the need for clean energy in South Africa of the proposed activity. The need and desirability must also indicate if the proposed development is needed in the region and if the current proposed location is desirable for the proposed activity compared to other sites. The need and desirability must take into account cumulative impacts of the proposed development in the area.	Need and Desirability is discussed in detail in line with the Department of Environmental Affairs (DEA) 2017 Guideline on Need and Desirability.	Section 5 Need & Desirability

No.	Comment from DEA	EAP Response	Section in Report
27.	The EIAr must include a detailed cumulative impact assessment of the facility if there are other similar facilities within a 30km radius of the proposed development site. All the specialist studies e.g. biodiversity, visual, heritage etc. in the PoSEIA which is incorporated as part of the SR must also assess the facility in terms of potential cumulative impacts. The cumulative impact assessment for all identified and assessed impacts must indicate the following: – Identified cumulative impacts must be clearly defined, and where possible the size of the identified impact must be quantified and indicated, i.e. hectares of cumulatively transformed land. – Detailed process flow and proof must be provided, to indicate how the specialist's recommendations, mitigation measures and conclusions from the various developments in the area were taken into consideration in the assessment of cumulative impacts and when the conclusion and mitigation measures were drafted for this project. – Identified cumulative impacts associated with the proposed development must be rated with the significance rating methodology approved with the acceptance of the scoping report. – The cumulative impact significance rating must also inform the need and desirability of the proposed development. – A cumulative impact environmental statement on whether the proposed development must proceed.	All specialist studies assess cumulative impacts associated with the proposed development. The cumulative impacts are clearly defined and quantified where possible. Process flow and proof of the steps taken to assess cumulative impacts is provided and significance of the identified impacts is rated using approved methodology. Need and Desirability of the proposed development takes into account the regional context and cumulative impacts. The Impact Statement provided includes an assessment of the cumulative impacts.	

No.	Comment from DEA	EAP Response	Section in Report
28.	Please note that information on location of renewable energy developments can be accessed from https://www.environment.gov.za/mapsgraphics.	The DEA's Renewable Energy Environmental Authorisation 2019_Q1 layer was utilised to identify renewable energy facilities within 35 km of the proposed development to be cumulatively assessed by specialists. In addition the recently approved Paulputs PV 3 x 100 MW solar facility was cumulatively assessed by the specialists.	Section 11 Cumulative Impacts

No.	Comment from DEA	EAP Response	Section in Report
29.	A copy of the final site layout map. All available biodiversity information must be used in the finalisation of the layout map. Existing infrastructure must be used as far as possible e.g. roads. The layout map must indicate the following: – Wind turbine positions (numbered) and its associated infrastructure; – Permanent laydown area footprint; – Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible}; – Wetlands, drainage lines, rivers, stream and water crossing of roads and cables indicating the type of bridging structures that will be used; – The location of sensitive environmental features on site e.g. CBAs, heritage sites, wetlands, drainage lines, nesting and roosting sites, etc. that will be affected by the facility and its associated infrastructure; – Substation(s) and/or transformer(s) sites including their entire footprint; – Connection routes (including pylon positions) to the distribution / transmission network; – All existing infrastructure on the site, especially roads; – Buffer areas; – Buildings, including accommodation; and – All "no-go" areas.	All available biodiversity data and infrastructure (proposed and existing) is presented. The proposed position of the pylons would only be determined at a later stage. The specialists assessed impacts and identified sensitive areas within a 300 m corridor for the grid connection options.	Fig 7.1 Proposed Site Development Plan Fig 12.1 Environmental Sensitivity Map
30.	An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.	The environmental sensitivity map provides all specialist constraints and features identified on the proposed site.	Fig 12.1 Environmental Sensitivity Map

No.	Comment from DEA	EAP Response	Section in Report
31.	A map combining the final layout map superimposed (overlain) on the environmental sensitivity map.	The site layout plan provides the proposed site development plan superimposed onto the environmental sensitivity map.	Fig 7.1 Proposed Site Development Plan
32.	A shapefile of the preferred development layout/footprint must be submitted to this Department.	A shapefile of the preferred development footprint has been submitted to the Department.	Electronic copy included to DEA
33.	The EMPr to be submitted as part of the EIAr must include the following:		
34.	i. All recommendations and mitigation measures recorded in the EIAr and the specialist studies conducted.	All recommendations and mitigation measures are included in the EMPr.	App B: EMPr
35.	ii. The final site layout map.	Updated Site Layout included in EMPr.	App B: EMPr
36.	iii. Measures as dictated by the final site layout map and micro-siting.	All mitigation measures included in EMPr including micro-siting recommendations.	App B: EMPr
37.	iv. An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.	The environmental sensitivity map provides all specialist constraints and features identified on the proposed site and is included in the EMPr.	App B: EMPr
38.	v. A map combining the final layout map superimposed (overlain) on the environmental sensitivity map.	The Updated Site Layout provides the proposed site development plan superimposed onto the environmental sensitivity map and is included in the EMPr.	App B: EMPr
39.	vi. An alien invasive management plan to be implemented during construction and operation of the facility. The plan must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken.	An Alien Invasive Management Plan providing control methods for construction and operation is included in the EMPr.	App B: EMPr

No.	Comment from DEA	EAP Response	Section in Report
40.	vii. A plant rescue and protection plan which allows for the maximum transplant of conservation important species from areas to be transformed. This plan must be compiled by a vegetation specialist familiar with the site and be implemented prior to commencement of the construction phase.	A Plant Rescue and Protection Plan is provided in the EMPr. The plan was compiled by the Ecological Specialist familiar with the site.	App B: EMPr
41.	viii. An avifauna and bat monitoring and management plan to be implemented during the construction and operation of the facility. This plan must be drafted according to the iatest guidelines by a suitably qualified avifauna and bat specialist.	Post Construction Avifaunal and Bat Monitoring Plans are included in the EMPr. These plans comply with the latest guidelines.	App B: EMPr
42.	ix. A re-vegetation and habitat rehabilitation plan to be implemented during the construction and operation of the facility. Restoration must be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.	A Re-vegetation and Habitat Rehabilitation Plan is included in the EMPr. The plan recommends concurrent rehabilitation to reduce the amount of habitat converted at any one time.	App B: EMPr
43.	x. An open space management plan to be implemented during the construction and operation of the facility.	An Open Space Management Plan is included in the EMPr.	App B: EMPr
44.	xi. A traffic management plan for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimize impacts on local commuters e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations.	Traffic Management Plan included in EMPr. Due the rural nature of the site the impact on existing retail and commercial operations is expected to be negligible.	App B: EMPr
45.	xii. A transportation plan for the transport of components, main assembly cranes and other large pieces of equipment.	A Traffic Management Plan that provides abnormal load transportation recommendations is included in EMPr.	App B: EMPr

No.	Comment from DEA	EAP Response	Section in Report
46.	xiii. A storm water management plan to be implemented during the construction and operation of the facility. The plan must ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan must include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of storm water run-off.	A Storm Water Management Plan is included in the EMPr that provides mitigation measures for erosion and other hydrological impacts during construction and operation.	App B: EMPr
47.	xiv. A fire management plan to be implemented during the construction and operation of the facility.	Fire Management Plan for construction and operation included in EMPr.	App B: EMPr
48.	xv. An erosion management plan for monitoring and rehabilitating erosion events associated with the facility. Appropriate erosion mitigation must form part of this plan to prevent and reduce the risk of any potential erosion.	An Erosion Management Plan is included in the EMPr that provides mitigation measures for erosion.	App B: EMPr
49.	xvi. An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems.	Mitigation measures to prevent spillage of hazardous substances are included in the EMPr.	App B: EMPr
50.	xvii. Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants.	No hydrological features occur within the proposed development footprint however precautionary measures for protection of hydrological features are included in the EMPr.	App B: EMPr
51.	The EAP must provide detailed motivation if any of the above requirements is not required by the proposed development and not included in the EMPr.	All above requirements are included in the EMPr.	App B: EMPr

No.	Comment from DEA	EAP Response	Section in Report
52.	The EAP must provide the final detailed Site Layout Plan as well as the final EMPr for approval with the final EIAr as this Department needs to make a decision on the EIA, EMPr and Layout Plan	The environmental sensitivity map provides all specialist constraints and features identified on the proposed site overlain by the Site Layout Plan and is included in the EMPr.	App B: EMPr
53.	Please ensure that all the relevant Listing Notice activities are applied for, that the Listing Notice activities applied for are specific and that they can be linked to the development activity or infrastructure in the project description.	All relevant listed activities are applied for and specified.	Table 2.1: NEMA Listed Activities in Relation to the Proposed Development
Draft EIA Report Comments and Responses			
	On 08 December 2014 the Minister of Water and Environmental Affairs promulgated regulations in terms of Chapter 5 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), viz, the NEMA Environmental Impact Assessment (EIA) Regulations 2014 (GN R982, R983, R984 and R985 of 04 December 2014). The NEMA EIA Regulations, 2014 and listing notices, were subsequently amended on 07 April 2017 (refer to GN R324, R325, R326, R327 of 07 April 2017) and is being referred to as NEMA EIA Regulations, 2014, as amended. The same referencing would apply to the listing notices containing the listed activities that would require Environmental Authorisation.	This has been updated throughout the report and correctly referenced.	Section 2.1
	(a) Listed Activities i. Please ensure that all relevant listed activities are applied for, are specific and that it can be linked to the development activity or infrastructure as described in the project description. ii. If the activities applied for in the application form differ from those mentioned in the final EIAr, an amended application form must be submitted. Please note that the Department's application form template has been amended and can be downloaded from the following link ***https://www.environment.gov.za/documents/forms.***	All relevant listed activities are being applied for and are correct in the application form submitted.	Section 2.1, Table 2.1

No.	Comment from DEA	EAP Response	Section in Report
	(b) Alternatives i. Please provide a description of any identified alternatives for the proposed activity that are feasible and reasonable, including the advantages and disadvantages that the proposed activity or alternatives will have on the environment and on the community that may be affected by the activity as per Appendix 3 (1) (h) (i) of the EIA Regulations, 2014, as amended. Alternatively, you should submit written proof of an investigation and motivation if no reasonable or feasible alternatives exist in terms of Appendix 3. ii. Please note that information on location of renewable energy developments can be accessed from ***https://www.environment.gov.za/mapsgraphics***	A description of the identified alternatives has been included in this EIA Report, as per Appendix 3 of the EIA Regulations 2014, as amended.	Section 6

No.	Comment from DEA	EAP Response	Section in Report
	(c) Site Lay Out i. All available biodiversity information must be used in the finalisation of the layout map. Existing infrastructure must be used as far as possible e.g. roads. ii. The layout map must indicate the following: • Wind turbine positions (numbered) and its associated infrastructure; • Permanent laydown area footprint; • Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible); • Wetlands, drainage lines, rivers, stream and water crossing of roads and cables indicating the type of bridging structures that will be used; • The location of sensitive environmental features on site e.g. CBAs, heritage sites, wetlands, drainage lines etc. that will be affected by the facility and its associated infrastructure; • Substation(s) and/or transformer{s) sites including their entire footprint; • Connection routes (including pylon positions} to the distribution/transmission network; • All existing infrastructure on the site, especially roads; • Buffer areas; • Buildings, including accommodation; and • All "no-go" areas. iii. A map combining the final Layout Plan superimposed (overlain) on the environmental sensitivity map must also be included in the final EIAr.	All available biodiversity data and infrastructure (proposed and existing) is presented. The proposed position of the pylons would only be determined at a later stage. The specialists assessed impacts and identified sensitive areas within a 300 m corridor for the grid connection options. Fig 12.1 Environmental Sensitivity Map contains the final site layout plan overlain on the environmental sensitivity map.	Fig 7.1 Proposed Site Development Plan Fig 12.1 Environmental Sensitivity Map

No.	Comment from DEA	EAP Response	Section in Report
	(d) Cumulative Impact Assessment i. The EIAr must include a cumulative impact assessment of the facility if there are other similar facilities within a 30km radius of the proposed development site. The specialist studies e.g. biodiversity, visual, heritage etc. in the plan of study for EIA (PoSEIA) which is incorporated as part of the scoping report {SR) must also assess the facility in terms of potential cumulative impacts. The cumulative impact assessment for all identified and assessed impacts must indicate the following: • Identified cumulative impacts must be clearly defined, and where possible the size of the identified impact must be quantified and indicated, i.e. hectares of cumulatively transformed land; • Detailed process flow and proof must be provided, to indicate how the specialist's recommendations, mitigation measures and conclusions from the various developments in the area were taken into consideration in the assessment of cumulative impacts; • Identified cumulative impacts associated with the proposed development must be rated with the significance rating methodology approved with the acceptance of the scoping report; • The cumulative impact significance rating must also inform the need and desirability of the proposed development; and • A cumulative impact environmental statement on whether the proposed development must proceed.	The EIA Report includes cumulative assessment for similar facilities within a 35 km radius. Depending on the specialist study this 35 km radius was increased to determine the full extent of cumulative impacts. All specialist studies assess cumulative impacts associated with the proposed development. The cumulative impacts are clearly defined and quantified where possible. Process flow and proof of the steps taken to assess cumulative impacts is provided and significance of the identified impacts is rated using approved methodology. Need and Desirability of the proposed development takes into account the regional context and cumulative impacts. The Impact Statement provided includes an assessment of the cumulative impacts.	Section 11
	(e) Specialist Declaration of Interest i. Specialist Declaration of Interest forms must be attached to the final EIAr. You are therefore requested to submit original signed Specialist Declaration of Interest forms for each specialist study conducted. The forms are available on Department's website (please use the Department's template).	Each specialist report includes an original signed declaration of interest.	Volume III

No.	Comment from DEA	EAP Response	Section in Report
	(f) Undertaking of an Oath i. Please note that the final EIAr must have an undertaking under oath/ affirmation by the EAP. ii. Based on the above, you are therefore required to include an undertaking under oath or affirmation by the EAP (administered by a Commissioner of Oaths) as per Appendix 3 of the NEMA EIA Regulations, 2014, as amended, which states that the EIAr must include: "an undertaking under oath or affirmation by the EAP in relation to: (i) the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and I&APs; (iii)the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv)any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties".	An undertaking under oath by the EAP is included in the EIA Report.	Appendix A
	(g) Details and Expertise of the EAP i. You are required to include the details and expertise of the EAP in the EIAr, including a curriculum vitae, in order to comply with the requirements of Appendix 3 of the NEMA EIA Regulations, 2014, as amended.	The details and expertise of the EAP is included in the EIA Report, in the form of a CV.	Section 1.6 and Appendix A

No.	Comment from DEA	EAP Response	Section in Report
	(h)Public Participation Process i. The following information must be submitted with the final EIAr: • A list of registered interested and affected parties as per Regulation 42 of the NEMA EIA Regulations, 2014, as amended; • Copies of all comments received during the draft EIAr comment period; and • A comment and response report which contains all comments received and responses provided to all comments and issues raised during the public participation process for the draft EIAr. Please note that comments received from this Department must also form part of the comment and response report. ii. Please ensure that all issues raised and comments received during the circulation of the draft EIAr from registered I&APs and organs of state which have jurisdiction (including this Departments Biodiversity Section) in respect of the proposed activity are adequately addressed in the final EIAr. iii. Proof of correspondence with the various stakeholders must be included in the final EIAr. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments. The Public Participation Process must be conducted in terms of Regulation 39, 40, 41, 42, 43 & 44 of the EIA Regulations 2014, as amended.	A list of I&APs, copies of all comments received and a comments and response report has been include as part of the EIA Report. Proof of all correspondence is also included. All comments received during the public review and comment period have been addressed.	Volume II

No.	Comment from DEA	EAP Response	Section in Report
	(i) Environmental Management Programme i. The EMPr must also include the following: • All recommendations and mitigation measures recorded in the EIAr and the specialist studies conducted. • An environmental sensitivity map indicating environmental sensitive areas and features identified during the assessment process. • Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants. ii. In addition to the above, the EMPr must comply with Appendix 4 of the EIA Regulations, 2014, as amended	The environmental sensitivity map provides all specialist constraints and features identified on the proposed site overlain by the Site Layout Plan and is included in the EMPr. Measures for protection of hydrological features are included in the EMPr. The EMPr complies with Appendix 4 of the EIA Regulations, 2014, as amended	Figure 12.1 - Environmental Sensitivity Map EMPr - Appendix B
	General Please note that the final EIAr must comply with all conditions of the acceptance of the scoping report (SR) signed on 15 May 2019, and must address all comments contained in the FSR and this letter.	The final EIAr complies with all conditions of the acceptance of the scoping report (SR) signed on 15 May 2019, and has addressed all comments contained in the FSR and this letter	Table 1.2
	The EIAr must provide the technical details for the proposed facility in a table format as well as their description and/or dimensions. A sample of the minimum information required is listed under point 2 of the EIA information required for solar energy facility as requested in the acceptance of the SR.	Technical details for the proposed facility as well their description and/or dimensions are provided in the DEA table format in the EIAr.	Table B: DEA Information Requirements - WEF Technical Details, and Table C: DEA Information Requirements - Grid Connection Technical Details Section 1.4, Table 1.2 WEF and Grid Technical Details

No.	Comment from DEA	EAP Response	Section in Report
	Please also ensure that the final EIAr includes the period for which the Environmental Authorisation is required and the date on which the activity will be concluded as per Appendix 3 of the NEMA EIA Regulations, 2014, as amended.	The period for which environmental authorisation is required is included on the EIA Report. Regarding the date on which the activity will be concluded, it cannot not be determined at this time, as the development is subject to the REIPPPP. The conclusion of the activity will only be determined, once the project is awarded preferred bidder and after financial close. It is estimated that the activity will be concluded approximately 24 months from commencement. Thereafter the project will proceed to the operational phase, which is estimated to last approximately 20 - 30 years.	Section 13 Table 13
	You are further reminded to comply with Regulation 23 (1)(a) of the NEMA EIA Regulations, 2014, as amended, which states that: "The applicant must within 106 days of the acceptance of the scoping report submit to the competent authority - (a) an environmental impact assessment report inclusive of any specialist reports, and an EMPr, which must have been subjected to a public participation process of at least 30 days and which reflects the incorporation of comments received, including any comments of the competent authority."	This applicant complies with this regulation. The report will be submitted within the timeframes required as per the NEMA EIA Regulations 2014, as amended.	N/A

No.	Comment from DEA	EAP Response	Section in Report
	Should there be significant changes or new information that has been added to the EIAr or EMPr which changes or information was not contained in the reports or plans consulted on during the initial public participation process, you are required to comply with Regulation 23(1)(b) of the NEMA EIA Regulations, 2014, as amended, which states: "The applicant must within 106 days of the acceptance of the scoping report submit to the competent authority- (b) a notification in writing that the reports, and an EMPr, will be submitted within 156 days of acceptance of the scoping report by the competent authority, or where regulation 21(2) applies, within 156 days of receipt of application by the competent authority, as significant changes have been made or significant new information has been added to the environmental impact assessment report or EMPr, which changes or information was not contained in the reports or plans consulted on during the initial public participation process contemplated in subregulation (1)(a) and that the revised environmental impact assessment report or EMPr will be subjected to another public participation process of at least 30 days".	No significant changes or new information has been added to the EIAr or EMPr. Amendments made from Draft EIA Report to Final EIA Report are provided from Page i - ii of this report (Volume I Final EIA Report).	Page i - ii

1.3 Overview of the EIA Process

The National Environment Management Act, 1998 (Act No 107 of 1998) (NEMA) promotes the use of scoping and EIA 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 has been considered and as appropriate, incorporated into the FSR and Plan of Study for EIA (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 review FSR and PSEIA as submitted to the DEA.

The DEA accepted the FSR on 20 May 2019. This marks the formal end of the scoping phase, after which the EAP undertakes the EIA and compiles the Draft EIA Report (DEIAR) which is then, like the Draft Scoping Report, made available for public and stakeholder comment for a period of 30 days. Any comments will then be considered and incorporated as applicable into a Final EIA Report (FEIAR) (this document). I&APs will then be notified of the availability of the FEIAR for their review as per the FSR.

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

1.4 WEF and Grid Technical Details

Table 1.2: WEF and Grid Technical Details

Aspect	Description
Total developable area under consideration	11 813 ha
Current land use	Low density grazing
WEF capacity	300 MW

Aspect	Description
Number of turbines	Maximum 75 turbines
Hub height	140 m Maximum tip height 230 m
Blade length	90 m
Rotor diameter	180 m
Capacity of onsite switching station	132 kV
Area proposed to be occupied by inverter, transformer stations / switching stations	The three substation compounds options are 4 hectares each to allow for a 1.1 hectare substation, 0.5 hectare office block, 1 hectare permanent laydown and 1 hectare temporary laydown. Maximum for switching stations 1.1 ha x 3 compounds = 3.3 ha
Area proposed to be occupied the office and laydown areas	Maximum 2.5 ha x 3 compounds = 7.5 ha
Area proposed to be occupied by turbine base, crane pad	Approximately 0.8 ha (total 60 ha for the maximum 75 turbines)
Length of internal roads	Approximately 80 km
Length of grid connection	Three grid connection overhead powerline route options are proposed - Options A and B are approximately 19.6 km in length, while overhead powerline Option C is approximately 12.5 km
Length of service road	Up to 26.8 km (worst case scenario)
Capacity of grid connection	132 kV
Connecting Eskom Substation	Paulputs

1.5 The Applicant

In accordance with the REIPPP bid requirements WKN-Windcurrent South Africa (Pty) Ltd (WKN-WC), a South African registered company dedicated to the development of wind energy projects to supply energy to the national grid has established the Paulputs Wind Energy Facility (RF) (Pty) Ltd as a Special Purpose Vehicle (SPV) that will be used to own all the authorisations, contracts, permits and licenses required to lawfully build and operate the proposed Paulputs WEF.

1.6 Details of the EAP

The co-ordination and management of this environmental application process is being conducted by Arcus Consultancy Services South Africa (Pty) Ltd ('Arcus') with the lead EAP being Ashlin Bodasing. Refer to Appendix A for the EAP's Declaration of Interest and *Curriculum Vitae*.

Ashlin Bodasing

Qualifications	Bachelor of Social Science (Geography and Environmental Management)
Experience in Years	14 years
Experience	Ashlin Bodasing is the Technical Director at Arcus, located in Cape Town. Having obtained her Bachelor of Social Science Degree from the University of Kwa-Zulu Natal; she has over 14 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. 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 reviews. She has worked in Mozambique, Botswana, Lesotho and Zimbabwe.

Ryan David-Anderson

Qualifications	Bachelor of Science (Environmental Science and Botany)
Experience in Years	8
Experience	Ryan David-Andersen is an Environmental Consultant with specialisation in sustainability and botany. Ryan has cultivated diverse experience in the environmental field during his 8 years working in the industry. He has fulfilled the role of Environmental Assessment Practitioner on several EIA and BAR Projects in South Africa and Botswana including ecological and botanical specialist input. Ryan has extensive construction (on-site) Environmental Control Officer experience on large developments such as wind farms, substations and mines. Knowledge of the EIA process combined with practical on-site implementation experience means that Ryan has an in-depth understanding of integrated environmental management and the principles of sustainable development.

Aneesah Alwie

Qualifications	Bachelor of Science (Environmental and Water Science)
Experience in Years	6
Experience	Aneesah Alwie is an Assistant at Arcus. Having obtained her Bachelor of Science Degree (Environmental and Water Science) from the University of the Western Cape; she has over 8 years public relations experience in conjunction with 6 years' experience as support to a technical team. Aneesah offers administrative and technical support to ensure that projects are completed in time and within budget. Key qualifications as the administrative assistant is that she excels in multitasking, data capturing, communication and organizational skills, problem solving and attention to detail. Her excellent organisational skills and extensive experience in support to project managers enables smooth flow of the assigned project duties and meeting project deadlines. Aneesah manages and assists with the concise and accurate operation of the public participation processes for projects.

Arcus is a specialist environmental consultancy providing environmental services to the renewable energy market. Arcus has advised on over 150 renewable energy projects in the United Kingdom and South Africa, with environmental management and in-house specialist services.

1.6.1 The Specialists

The EAPs have assembled a team of technical specialists to undertake studies for the proposed Paulputs WEF and grid connection.

The specialists' fields of investigation are listed in Table 1.2 below. The areas of investigation have been identified as relevant to the proposed development as per the experience of the EAP and consultation with the listed specialists who have been selected based on their experience in the field of EIA and of renewable energy projects, and the locality of the proposed development.

External independent reviews will be conducted on in house specialist's reports, this will be included in the Final EIA Report submitted. This is to include any changes based on the public participation review process.

Table 1.1 List of Specialist Investigations

Discipline	Specialist	Specialist Organisation
Avifauna preconstruction monitoring and impact assessment	Andrew Pearson Anja Albertyn	Arcus
External Independent Review of Avifauna Impact Assessment Report	Chris van Rooyen	CvR Consulting
Bat preconstruction monitoring and impact assessment	Jonathan Aronson	Arcus
External Independent Review of Bat Impact Assessment Report	Kate MacEwan	Inkululeko Wildlife Services (Pty) Ltd
Terrestrial ecology (flora and fauna)	Simon Todd	3Foxes Consulting
Soil, land use and agricultural potential	Johann Lanz	Private Consultant
Aquatics	Brian Colloty	EnviroSci
Heritage, archaeology and palaeontology	Jayson Orton	ASHA Consulting
Socio-Economic	Leandri Kruger	Private Consultant
Noise	Alan Moore	Arcus
External Independent Review of Noise Impact Assessment Report	Morné de Jager	Enviro-Acoustic Research cc
Visual	Kerry Schwartz	SiVest
Traffic and transportation	Stephen Fautley	TechSO
Geotechnical	Alex Lodenkemper	SMEC South Africa (Pty) Ltd

1.7 Structure of this Report

The EIA Report is set out in three volumes:

Volume I: EIA Report;

Volume II: Public Participation Report (including Comments and Responses table); and

Volume III: Specialist Reports.

1.8 Assumptions and Limitations

The following assumptions and limitations are noted for the EIA Report and the specialist studies conducted as part of the EIA process for the proposed development. The assumption is made that the information on which this report is based (baseline studies and project information, as well as existing information) is accurate and correct.

1.8.1 Geology, Soils and Agriculture

The study makes the assumption that water for irrigation is not available across the site. This is based on the assumption that a long history of farming experience in an area will result in the exploitation of viable water sources if they exist, and none have been exploited in this area. There are no other specific assumptions, constraints, uncertainties and gaps in knowledge for this study.

1.8.2 Geotechnical

The desktop report is based on data obtained from a limited number of sources, including geological records, topographic maps, aerial imagery and geotechnical and geological literature available for the greater Pofadder region. The nature of geotechnical engineering is such that variations in soil and rock conditions may occur even where sites seem to be consistent. Variations in what is reported here will become evident during site investigation and construction. It is imperative that potential variations in geological and geotechnical conditions described herein are delineated via preliminary and detailed geotechnical investigations of the subject site. It is noted, that on a conceptual basis, the current project may be considered as a Category 4 project (Silva et al, 2008) requiring desktop study equivalent information to determine the pre-feasibility of the project. However, once the project progresses to preliminary and thereafter to detailed design it will then class as a Category 2 and Category 1 project respectively requiring equivalent geotechnical input. Thus, to lower the probability of failure of the final designed structures, as well as to avoid over-design to compensate for tolerable risk, a detailed geotechnical investigation of the site must be considered mandatory as the project approaches Category 2 and 1 status. This philosophical approach forms the basis of Eurocode 7 (2004) where geotechnical design and structural design go hand-in-hand. Thus, this desktop evaluation report will culminate with recommendations for detailed geotechnical investigations that will provide the engineer with the necessary parameters for detailed design purposes.

1.8.3 Freshwater and Wetlands

No base-line long-term monitoring was undertaken as part of this assessment. However, a concerted effort was made to assess as much of the potential site, as well as make use of any available literature, species distribution data and aerial photography. Furthermore, based on the previous assessments undertaken between 2010-2018 in the area and this was not foreseen as a huge limiting factor. The level of investigation undertaken is sufficient to inform this assessment.

It should be emphasised that information, as presented in the Aquatic Assessment Report, only has reference to the study area as indicated on the accompanying maps. Therefore, this information cannot be applied to any other area without detailed investigation.

It is assumed that any existing roads and tracks within the facility will be upgraded, while the new roads and associated transmission lines can avoid or span the observed watercourses as far as possible. A further assumption is that water will be sourced from a licensed resource and not illegally abstracted from any surrounding watercourses, particularly if dust suppression is required.

1.8.4 Flora and Terrestrial Fauna

The ecological study consists of a detailed field assessment conducted across several site visits as well as a desktop study, which serves to significantly reduce the limitations and assumptions required for the study. In addition, the adjacent farms around the Paulputs Substation have been previously assessed by the consultant for several different projects, with the result that area is well known and has been sampled at different times of the year over a period of several years. For the current assessment, sampling took place in the wet season, but conditions were still relatively dry during each of the site visits and the majority of vegetation across the site was relatively dry and in a dormant state. As a result, some plant species were not visible at the time and only the lists of the perennial species are considered reliable. While this poses some limitations for the study, the different habitats present could still be easily discerned based on the vegetation present and this is not likely to significantly affect the sensitivity mapping of the site or the characterisation of the plant communities present. As, while there are a variety of annuals and geophytes present in the area, these are almost all common and widespread species and the species of concern that may be present are either larger perennials or smaller succulents that are less vulnerable to seasonal and inter-annual variations in moisture availability. Thus, the dry conditions over the study period is seen to pose some limit the number of annuals and geophytes that were encountered in the field survey, but the consequence of this is not seen as being of high significance for the study and is not considered to impose a serious limitation on the study.

Many fauna are difficult to observe in the field and their potential presence at a site must be evaluated based on the literature and available databases. However, many remote areas have not been well-sampled with the result that the species lists derived for such areas do not always adequately reflect the actual fauna present. In order to reduce this limitation, and ensure a conservative approach, the species lists derived for the site from the literature were obtained from an area significantly larger than the study site and are likely to include a much wider array of species than actually occur at the site. In addition, the camera trapping that was conducted at the site provides a reliable baseline of larger vertebrates present at the site and provides an actual indication of the fauna present and their levels of activity and distribution across the site. This is considered to be a cautious and conservative approach to the assessment and is considered significantly more reliable and robust than relying on available information alone, especially for such a poorly known area.

1.8.5 Avifauna

- The SABAP-1 data covers the period 1986 – 1997. Bird distribution patterns fluctuate continuously according to availability of food and nesting substrate. (For a full discussion of potential inaccuracies in SABAP data, see Harrison *et al.* 1997);
- There is still limited information available on the environmental effects of wind energy facilities in South Africa. Only a summary of the results of post-construction monitoring from eight wind farms in South Africa is available (Ralston Paton *et al.* 2017). Estimates of impacts are therefore also based on knowledge gained internationally, which should be applied with caution to local species and conditions; and

- While sampling effort was conducted as recommended in the guidelines, to achieve statistically powerful results it would need to be increased beyond practical possibilities. The data was therefore interpreted using a precautionary approach.

1.8.6 Bats

The following assumptions and limitations relevant to this study are noted:

- The knowledge of certain aspects of South African bats including natural history, population sizes, local and regional distribution patterns, spatial and temporal movement patterns (including migration and flying heights) and how bats may be impacted by wind energy is very limited for many species.
- Bat echolocation calls (i.e. ultrasound) operate over ranges of metres therefore acoustic monitoring samples only a small amount of space (Adams et al. 2012). Recording a bat using sound is influenced by the type and intensity of the echolocation call produced, the species of bat, the bat detector system used, the orientation of the signal relative to the microphone and environmental conditions such as humidity. One must therefore be cautious when extrapolating data from echolocation surveys over large areas because only small areas are actually sampled.
- There can be considerable variation in bat calls between different species and within species. The accuracy of the species identification is also very dependent on the quality of the calls used for identification. Species call parameters can often overlap, making species identification difficult.
- Bat activity recorded by bat detectors cannot be used to directly estimate abundance or population sizes because detectors cannot distinguish between a single bat flying past a detector multiple times or between multiple bats of the same species passing a detector once each (Kunz et al. 2007a). This is interpreted using the specialists' knowledge and presented as relative abundance.
- There is currently no standard scale to rate bat activity as low, medium or high. Following Adams et al. (2015) and Lintott et al. (2017), percentiles were used to provide an objective assessment of relative bat activity levels using presence-only data (i.e. only nights with bat activity). Data from this study were compared 1) to data from 16 other locations across the country (i.e. National comparison), 2) to data from six other locations in the (Nama- and Succulent) Karoo biomes (i.e. Regional comparison), and 3) across the Paulputs sampling locations only (i.e. Site comparison). Six percentile thresholds were defined as follows:
  - low activity: 0-20th percentiles;
  - low to moderate activity: 21st-40th percentiles;
  - moderate activity: 41st-60th percentiles;
  - moderate to high activity: 61st-80th percentiles;
  - high activity: 81st-95th percentiles; and
  - very high activity: 95th-100th percentiles.
- The potential impacts of wind energy on bats presented in the Bat Assessment Report (Volume III), represent the current knowledge in this field. New evidence from research and consultancy projects may become available in future, meaning that impacts and mitigation options presented and discussed in the Bat Assessment Report may be adjusted if the project is developed.
- While the data presented in the Bat Assessment Report provides a baseline of bat activity for the period sampled, it does not allow for an understanding of interannual variation in bat activity. It is therefore possible that during the lifespan of the facility, bat activity could be significantly different (lower or higher) compared to the baseline presented in the Bat Assessment Report.

1.8.7 Noise

Noise sources occurring during construction and decommissioning have been assumed on the basis of typical construction methods for the type of development. Source levels have been obtained from published data, i.e. BS 5228:2014, which is a well-recognised source of such information.

At the time of writing, a definite turbine model has not been selected for use at the proposed development; a candidate turbine model has therefore been assessed. Based upon Arcus's substantial experience of wind turbine noise, the candidate turbine type is considered to be a worst-case within the range of dimensions under consideration in terms of noise emissions.

1.8.8 Heritage, Archaeology and Palaeontology

The field study was carried out at the surface only and hence any completely buried archaeological and/or palaeontological sites would not be readily located. Similarly, it is not always possible to determine the depth of archaeological material visible at the surface. However, desktop work and prior experience in the area suggests that the chances of buried archaeology out on the open are very low and this is assumed to be true of the present study area as well.

The study area is very large and was not covered in detail. The survey aimed to locate heritage resources rather than examine turbine footprints, since it was assumed that the usual pattern of sites being associated with rocky hills and water sources would hold true. It should be noted that the survey was done during the scoping phase and its results were used to inform the final layout to be assessed. This was done to reduce the chances of significant impacts occurring.

One camp in the WEF study area was not accessed due to it being locked but it was possible to climb over the fence to examine some rocky hills close to its edge. However, the landscape is very consistent across the greater study area and no particular variation is expected in this or any other unexamined areas.

The power line routes could not be examined because access had not been negotiated. For this reason a desktop study was undertaken using information already on record and the experience of the author in the study area. A 2 km section of Options A & B have, however, been surveyed by the present author for a different project. Power line Option C was only proposed after the scoping phase and although it was not considered at all during that phase, it was considered and assessed during the EIA phase.

1.8.9 Visual

- The identification of visual receptors involved a combination of desktop assessment as well as field-based observation undertaken during the scoping phase of the project. Initially Google Earth imagery was used to identify potential receptors within the study area. Where possible, these receptor locations were verified and assessed during a site visit which was undertaken between the 26th and the 28th of November 2018. Due to the extent of the study area however, and the fact that many of the identified receptors are farm houses on private property, it was not possible to visit or verify every potentially sensitive visual receptor location. As such, a number of broad assumptions have been made in terms of the likely sensitivity of the receptors to the proposed development. It should be noted that not all receptors would necessarily perceive the proposed development in a negative way. This is usually dependent on the use of the facility, the economic dependency of the occupants on the scenic quality of views from the facility and on people's perceptions of the value of "Green Energy". Sensitive receptor locations typically include sites such as tourism facilities and scenic locations within natural settings which are likely to be adversely affected by the visual intrusion of the proposed development. Thus the presence of a receptor in an area potentially affected by the proposed development does not necessarily mean that a visual impact will be experienced.

- Wind turbines are very large structures and could impact on visual receptors that are located relatively far away, particularly in areas where the terrain is very flat. Given the nature of the receiving environment and the height of the proposed wind turbines, the study area or visual assessment zone is assumed to encompass an area of 10km from the boundary of the WEF application site. This limit on the visual assessment zone relates to the fact that visual impacts decrease exponentially over distance. Thus although the wind turbines may still be visible beyond 10km, the degree of visual impact would diminish considerably. As such, the need to assess the impact on potential receptors beyond this distance would not be warranted.
- In assessing the potential visual impacts for the proposed 132kV power line, the visual assessment zone is assumed to encompass a zone of 5km from the outer boundary of the power line assessment corridors. It should be noted that an additional grid connection option is being considered in this phase of the project and as such the area now being assessed is somewhat larger that the area assessed in the scoping phase of the project.
- For the purposes of the EIA-level study, all modelling and analysis is based on a worst case scenario where the structure height has been assumed to be 230m (at blade tip).
- Due to the varying scales and sources of information; maps may have minor inaccuracies. Terrain data for this area derived from the National Geo-Spatial Information (NGI)'s 25m DEM is fairly coarse and somewhat inconsistent and as such, localised topographic variations in the landscape may not be reflected on the Digital Elevation Model (DEM) used to determine viewsheds.
- A preliminary viewshed based on the turbine layout provided, showed that no screening would be provided by the topography and as such the proposed development would be visible from all areas within a 10km radius of the application site. Accordingly, no viewshed maps have been included in this report.
- The potential visual impact at each visual receptor location was assessed using a matrix developed for this purpose. The matrix is based on three main parameters relating to visual impact and, although relatively simplistic, it provides a reasonably accurate indicative assessment of the degree of visual impact likely to be experienced at each receptor location as a result of the proposed development. It is however important to note the limitations of quantitatively assessing a largely subjective or qualitative type of impact and as such the matrix should be seen as merely a representation of the likely visual impact at a receptor location.
- Comments received from South African Heritage Resource Agency (SAHRA) during the scoping phase of the process have been addressed and incorporated into this report. Any further feedback from the public during the review period of the Draft Environmental Impact Assessment Report (DEIAR) will be incorporated into further drafts of the Visual Impact Assessment (VIA) report. No further feedback was received during the DEIAR public review period.
- At the time of undertaking the visual study there was no information available regarding the type and intensity of lighting that will be required for the proposed WEF and thus the potential impact of lighting at night has not been assessed at a detailed level. However, lighting requirements are relatively similar for all WEFs and as such, general measures to mitigate the impact of additional light sources on the ambiance of the nightscape have been provided.
- This study includes an assessment of the potential cumulative impacts of other renewable energy developments on the existing landscape character and on the identified sensitive receptors. This assessment is based on the information available at

the time of writing the VIA report and where information has not been available, broad assumptions have been made as to the likely impacts of these developments.

- At the time of writing the VIA report, the proposed turbine layout, (including the choice of turbine size) was still in the preliminary design phase and as such, no visualisation modelling was undertaken for the WEF project. Although the WEF will introduce a new development in the area and result in some change to the visual character, the area is not regarded as a protected landscape. This can however be provided should the Public Participation process identify the need for this exercise.
- It should be noted that the site visit was undertaken in the last week of November 2018, during early summer. Typically, the visual impact of a WEF development would be less significant during the rainy periods of the year than it would during the drier periods when the surrounding vegetation is expected to provide less potential screening. The study area is however typically characterised by low levels of rainfall all year round and therefore the time of the year is not expected to affect the significance of the visual impact of the proposed development. In addition, the vegetation cover within the study area is largely dominated by low shrubs and thus vegetation cover is not expected to have a significant effect on the visual impact of the proposed development.
- The weather conditions in the study area also affect the visual impact of the proposed development to some degree. The site visit was undertaken in clear weather conditions which tend to prevail for most of the year due to the low levels of rainfall in the area. In these clear conditions, wind turbines would present a greater contrast with the surrounding landscape than they would during overcast conditions. The weather conditions during the time of the study were therefore taken into consideration when undertaking this VIA.

1.8.10 Social

The first assumption in preparing the SIA Report for the proposed Paulputs WEF and due to the limitations discussed below, is that the proposed site for the establishment of the Paulputs WEF is technically suitable for the establishment of a wind energy facility. The second assumption identified is the strategic importance of promoting renewable energy like onshore wind energy. Additionally, the fit with key policy and planning documents is a key component in the SIA process, to identify and assess potential social impacts for the proposed development. The proposed study however does recognise the strategic importance of promoting renewable energy like wind energy, and can therefore support the development of the proposed Paulputs WEF. One limitation that could be identified is that the demographic data was based on the most recent available Census data from the year 2011. This data can be considered dated and should be treated with caution. It was however useful in compiling a demographic profile of the affected area of the proposed development. Where necessary the data was however updated with the data from the Community Survey in 2016. A second identified limitation is that the site visit was conducting over the festive season therefore not all potential stakeholders were available for consultations. Follow-up consultations were scheduled telephonically, however stakeholders identified their unavailability to interviews and/or were unwilling to provide their input. For this reason the specialist extended the review of reports similar to the Paulputs WEF, and with the specialists experience with similar projects, this limitation does not affect the findings of this SIA report.

1.8.11 Traffic and Transportation

The WEF construction period is expected to last at least 24 months. The grid substation and connections are expected to take 18 months. The WEF and the grid construction will run concurrently. The construction period will generate the most traffic, both on public roads and on-site. For the purposes of specialist report it was assumed that all construction will be completed within 24 months, as a worst-case scenario, and that a maximum of 75 Wind Turbine Generators will be constructed.

1.9 Deviations from Plan of Study

There are no deviations from the approved plan of study.

2 ENVIRONMENTAL LEGAL FRAMEWORK

2.1 The National Environment Management Act, 1998 (Act No 107 of 1998)

Section 2 of the National Environment Management Act, 1998 (NEMA) as amended, lists environmental principles that are to be applied by all organs of state regarding proposals that may significantly affect the environment. Included amongst the key principles is the principle that all development must be socially, economically and environmentally sustainable, environmental management must place people and their needs at the forefront of its concern, to serve their physical, psychological, developmental, cultural and social interests equitably.

NEMA also provides for the participation of I&APs and it stipulates that decisions must take the interests, needs and values of all I&APs into account.

Chapter 5 of NEMA outlines the general objectives and implementation of Integrated Environmental Management (IEM), the latter providing a framework for the integration of environmental issues into the planning, design, decision-making and implementation of plans and development proposals. Section 24 provides a framework for the granting of environmental authorisations.

In order to give effect to the general objectives of IEM, the potential impacts on the environment of listed activities must be considered, investigated, assessed and reported to the competent authority. Section 24(4) outlines the minimum requirements for procedures for the investigation, assessment and communication of the potential impact of activities.

The NEMA EIA Regulations 2014, as amended by GNR 326 of 2017 provide for the control of certain Listed Activities. These activities are listed in Government Notice No. R327 (Listing Notice 1 – Basic Assessment), R325 (Listing Notice 2 – Scoping & EIA Process) and R324 (Listing Notice 3 – Basic Assessment) of 7 April 2017, and are prohibited to commence until environmental authorisation has been obtained from the competent authority, in this case, the Department of Environmental Affairs (DEA).

In July 2016, the Minister of Environmental Affairs published a notice stating that the National Department of Environmental Affairs is the Competent Authority for processing applications for Environmental Authorisations which relates to the Integrated Resources Plan (IRP) 2010 - 2030 and any updates thereto.

Any application for an Environmental Authorisation for a Renewable Energy project, whereby the developer intends to bid it in the DoE REIPPPP will be dealt with by the DEA.

Environmental authorisation, which may be granted subject to conditions, will only be considered upon compliance with GNR326 of the NEMA EIA Regulations, as amended.

Any Environmental Authorisation obtained from the DEA applies only to those specific listed activities for which the application was made. To ensure that all Listed Activities that could potentially be applicable to this proposal are covered by the Environmental Authorisation, a precautionary approach is followed when identifying listed activities, that is, if an activity could potentially be part of the proposed development, it is listed.

The Listed Activities applicable to this proposed project are presented in Table 2.1 below. All potential impacts associated with these Listed Activities will be considered and adequately assessed in this authorisation process.

Table 2.1: NEMA EIA Regulations 2014, as amended Listed Activities in Relation to the Proposed Development

Listing Notices 1 - 3	***Listed Activity***	**Description of project activity that triggers listed activity**
Listing Notice 1 GN R 327 Activity 11	*The development of facilities or infrastructure for the transmission and distribution of electricity— (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.*	Electrical reticulation will be installed to transfer electricity from the turbines to an on-site substation. Cables will be installed underground where feasible. These internal transmission lines are expected to be of 33 kV capacity. 132 kV overhead powerlines will be installed to transfer electricity from the on-site substation to the existing Eskom substation.
Listing Notice 1 GN R 327 Activity 12	*The development of- (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs (a) within a watercourse (c) if no development setback exists within 32 m of a watercourse, measured from the edge of a watercourse*	Infrastructure such as roads is proposed within 32 m of a watercourse. The cumulative footprint of all proposed development within 32 m of a watercourse may exceed 100 square metres.
Listing Notice 1 GN R 327 Activity 14	*The development and related operation 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 or more but not exceeding 500 cubic metres.*	Construction of the proposed development will require dangerous goods in the form of hydrocarbon fuels (e.g. diesel), paints and solvents, oils and greases. Sewage and waste streams will be generated by the WEF. During construction of the WEF in particular the combined capacity of dangerous goods on site may exceed 80 cubic metres. The proposed on-site substation is likely to require the use of transformer oils/other hazardous substances during the operational phase.
Listing Notice 1 GN R 327 Activity 19	*The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;*	The construction of the overhead powerline could include the excavation of soil in watercourses/drainage line areas, and infilling/deposition may exceed 5 cubic metres and in some instances may exceed 10 cubic metres. Figure shows the location of water crossings.
Listing Notice 1 GN R 327 Activity 24	*The development of a road - (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;*	Internal access roads of 12 m will be required between turbines.
Listing Notice 1 GN R 327 Activity 28	*Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development: (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.*	Construction of the proposed development will change the land use from agriculture to mixed - agriculture and electricity generation and transmission. The proposed development is outside an urban area and has a footprint that will exceed 1 ha.
Listing Notice 1 GN R 327	*The expansion of- Infrastructure or structures where the physical footprint is expanded by 100*	Existing infrastructure such as roads and bridges within 32 m of a watercourse may require expansion. The cumulative footprint

Listing Notices 1 - 3	***Listed Activity***	**Description of project activity that triggers listed activity**
Activity 48	*square metres or more; where such expansion occurs- (a) within a watercourse; (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse*	of all proposed development expansion within 32 m of a watercourse may exceed 100 square metres.
Listing Notice 1 GN R 327 Activity 56	*The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre -* *(ii) where no reserve exists, where the existing road is wider than 8 metres;*	Existing farm access roads may need to be widened or lengthened. These roads would currently have no road reserve and may be wider than 8 m in some areas.
Listing Notice 2 GN R 325 Activity 1	*The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more.*	The WEF will consist of a number of wind turbines for electricity generation with a combined capacity of more than 20 MW.
Listing Notice 2 GN R 325 Activity 15	*The clearance of an area of 20 hectares or more of indigenous vegetation.*	The construction of the proposed development will require the clearance of more than 20 hectares of indigenous vegetation in total across the site.
Listing Notice 3 GN R 324 Activity 4	*The development of a road wider than 4 metres with a reserve less than 13,5 metres* *(g) Northern Cape* *(ii) Outside urban areas:* *(ee) Critical Biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;*	Internal and external access roads will be constructed, which are wider than 4 m. The site falls outside of an urban area and part of it falls within a CBA 1.
Listing Notice 3 GN R 324 Activity 12	*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.* *(g) Northern Cape* *(ii) Within critical biodiversity areas identified in bioregional plans;*	The proposed development will require the clearance of natural vegetation in excess of 300 m^2 in areas of natural vegetation. Parts of the site fall within CBA 1.
Listing Notice 3 GN R 324 Activity 14	*The development of—* *(ii) infrastructure or structures with a physical footprint of 10 square metres or more;* *where such development occurs—* *(a) within a watercourse;* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;* *(g) Northern Cape* *(ii) Outside urban areas:* *(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans*	Bridges and infrastructure may be constructed within 32 m of watercourse(s). The site lies outside of an urban area and a portion of the site falls within a CBA 1.

Listing Notices 1 - 3	*Listed Activity*	Description of project activity that triggers listed activity
	adopted by the competent authority or in bioregional plans;	
Listing Notice 3 GN R 324 Activity 18	*The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre. (g) Northern Cape (ii) Outside urban areas (ee) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;*	Existing farm roads may need to be widened or lengthened. The site lies outside of an urban area and a portion of the site falls within a CBA 1.
Listing Notice 3 GN R 324 Activity 23	*The expansion of— (ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more; where such expansion occurs— (a) within a watercourse; (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; (g) Northern Cape (ee) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;*	The construction of the WEF may include the expansion of existing bridges over watercourses. The site lies outside of an urban area and a portion of the site falls within a CBA 1.

2.2 The National Heritage Resources Act, 1999 (Act No 25 of 1999)

Section 38 (1) of the National Heritage Resources Act, 1999 (NHRA) lists development activities that would require authorisation by the responsible heritage resources authority. Activities considered applicable to the proposed project include the following:

"*(a) The construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;*
(c) any development or other activity which will change the character of a site; and
(i) exceeding 5000 m² in extent."

The NHRA requires that a person intending to undertake such an activity must notify the relevant national and provincial heritage authorities at the earliest stages of initiating such a development.

The relevant heritage authority would then in turn, notify the person whether a Heritage Impact Assessment Report should be submitted. According to Section 38(8) of the NHRA, a separate report would not be necessary if an evaluation of the impact of such development on heritage resources is required in terms of the Environment Conservation Act, 1989 (No. 73 of 1989) (ECA) (now replaced by NEMA) or any other applicable legislation. The decision-making authority must ensure that the heritage evaluation fulfils the requirements of the NHRA and take into account any comments and recommendations made by the relevant heritage resources authority. As such, a Heritage Impact Assessment (HIA) will form part of this Environmental Impact Assessment (EIA) process.

In South Africa, the law is directed towards the protection of human made heritage, although places and objects of scientific importance are covered. The NHRA also protects intangible heritage such as traditional activities, oral histories and places where significant events happened. Generally protected heritage, which must be considered in any heritage assessment, includes:

- *Any place of cultural significance (described below);*
- *Buildings and structures (greater than 60 years of age);*
- *Archaeological sites (greater than 100 years of age);*
- *Palaeontological sites and specimens;*
- *Shipwrecks and aircraft wrecks; and*
- *Graves and grave yards.*

Section 3(3) of the NHRA defines the cultural significance of a place or objects with regard to the following criteria:

a. Its importance in the community or pattern of South Africa's history;
b. Its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
c. Its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
d. Its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
e. Its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
f. Its importance in demonstrating a high degree of creative or technical achievement at a particular period;
g. Its strong or special association with a particular community or cultural group for social cultural or spiritual reasons;
h. Its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and
i. Sites of significance relating to the history of slavery in South Africa.

While not specifically mentioned in the NHRA, routes of cultural or aesthetic significance are recognised as a category of heritage resources which require grading (clause "e" above).

The heritage impact assessment reports have been submitted to the SAHRA for comment.

2.3 Subdivision of Agricultural Land Act, 1970 (Act No. 70 of 1970)

In terms of the Subdivision of Agricultural Land Act, 1970, any application for change of land use must be approved by the Minister of Agriculture.

2.4 Conservation of Agricultural Resources, 1983 (Act No. 43 of 1983)

The Conservation of Agricultural Resources Act (CARA), 1983 states that no degradation of natural land is permitted. The Act requires the protection of land against soil erosion and the prevention of water logging and salinization of soils by means of suitable soil conservation works to be constructed and maintained. The utilisation of marshes, water sponges and watercourses are also addressed.

2.5 The Environment Conservation Act, 1989 (Act No.73 of 1989), the National Noise Control Regulations: GN R154 of 1992

The Environment Conservation Act, 1989 (ECA) allows the Minister of Environmental Affairs and Tourism (now the "Minister of Environmental Affairs") to make regulations regarding noise, amongst other concerns. The Minister has made noise control regulations under the ECA.

In terms of section 25 of the ECA, the national noise-control regulations (NCR) were promulgated (GN R154 in *Government Gazette* No. 13717 dated 10 January 1992). The NCRs were revised under Government Notice Number R. 55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations.

Subsequently, in terms of Schedule 5 of the Constitution of South Africa of 1996 legislative responsibility for administering the NCR was devolved to provincial and local authorities.

These regulations define "**disturbing noise**" as:

"*Noise level which exceeds the zone sound level or, if no zone sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 dBA or more*".

These Regulations prohibits anyone from causing a disturbing noise.

No provincial noise control regulations have been promulgated in the Northern Cape Province and thus the National Noise Control Regulations, 1992 are relevant for the construction phase of the Paulputs WEF and Grid Connection.

2.6 National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)

Section 34 of the Air Quality Act, 2004 (AQA) makes provision for:

(1) The Minister to prescribe essential national noise standards -
- (a)For the control of noise, either in general or by specified machinery or activities or in specified places or areas; or
- (b)For determining –
  - (i) a definition of noise; and
  - (ii) The maximum levels of noise.

(2) When controlling noise the provincial and local spheres of government are bound by any prescribed national standards.

This section of the Act is in force, but no such standards have yet been promulgated.

An atmospheric emission license issued in terms of Section 22 may contain conditions in respect of noise. However this is not relevant to the proposed development.

2.6.1 National Dust Control Regulations, 2013

The National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004), makes provision for national dust control regulations. These regulations prescribe dust fall standards for residential and non-residential areas. These Regulations also provide for dust monitoring, control and reporting.

The acceptable dust fall out rates are:

Restriction Area	**Dust Fall (D) (mg/m^2/day, 30 day average)**	**Permitted Frequency of exceedance**
Residential	D<600	Two within a year, not sequential months
Non- Residential	600 <D< 1200	Two within a year, not sequential months

2.7 National Water Act, 1998 (Act No. 36 of 1998)

The National Water Act, 1998 (NWA) provides for constitutional requirements including pollution prevention, ecological and resource conservation and sustainable utilisation. In terms of this Act, all water resources are the property of the State.

A water resource includes any watercourse, surface water, estuary or aquifer, and, where relevant, its bed and banks. A watercourse is interpreted as a river or spring; a natural channel in which water flows regularly or intermittently; a wetland lake or dam into which or from which water flows; and any collection of water that the Minister may declare to be a watercourse.

Relevant water uses for the proposed construction of the WEF and Grid Connection, which will require access roads over watercourses and drainage channels and boreholes for construction water, in terms of Section 21 of the Act include but are not limited to the following:

Section 21 (a): Abstraction of water from boreholes and rivers or dams;
Section 21 (b): Storage of water (dams or reservoirs);
Section 21 (c): Impeding or diverting the flow of water in a watercourse;
Section 21 (i): Altering the bed, banks, course or characteristics of a watercourse; and
Section 21 (g): Storage of domestic waste in conservancy tanks.

GN 1199 of 18 December 2009, grants general authorisation for the above water uses based on certain conditions. It is also stipulates that these water uses must be registered with the responsible authority.

Pollution of river water is a contravention of the NWA. Chapter 3, Part 4 of the NWA deals with pollution prevention and in particular the situation where pollution of a water resource occurs or might occur as a result of activities on land. The person who owns, controls, occupies or uses the land in question is responsible for taking measures to prevent pollution of water resources.

Chapter 3, Part 5 of the NWA deals with pollution of water resources following an emergency incident, such as an accident involving the spilling of a harmful substance that finds or may find its way into a water resource. The responsibility for remedying the situation rests with the person responsible for the incident or the substance involved.

2.7.1 Permit Requirements

The following WULAs or GAs could be required. This will be determined by the Department of Water & Sanitation during the WULA pre-application process.

- **DWS Notice 538 of 2016, 2 September in GG 40243 -** Section 21 a & b, Abstraction and storage of water.
- **Government Notice 509 in GG 40229 of 26 August 2016 -** Section 21 c & i, Impeding or diverting the flow of water in a watercourse and or altering the bed, banks, course or characteristics of a watercourse.
- **Government Notice 665, 6 September 2013 in GG 36820** (Has expired as GA is only valid for 5 years thus a full WULA will be required) - Section 21g Disposing of waste in a manner that may detrimentally impact on a water source which includes temporary storage of domestic waste water i.e. conservancy tanks under Section 37 of the notice.

	Water Use Activity	**Applicable to this development proposal**
S21(a)	Taking water from a water resource	Yes, as water might be abstracted from Orange River and/ or boreholes. GA is not applicable to the relevant catchments and a full WULA process will need to be followed. The WEF will require no more than 26 000 m^3 per annum during construction phase and an insignificant quantity of water during the operational phase.

	Water Use Activity	Applicable to this development proposal
S21(b)	Storing water	If the total volume stored is greater than 40 000 m^3 then a full Water Use License will be required. This is however unlikely as on-site water storage for the purpose of the WEF would not exceed this threshold.
S21(c)	Impeding or diverting the flow of water in a watercourse	Yes - several new crossings of watercourses will be required. A GA process can potentially be followed.
S21(d)	Engaging in a stream flow reduction activity	Not applicable
S21(e)	Engaging in a controlled activity	Not applicable
S21(f)	Discharging waste or water containing waste into a water resource through a pipe, canal, sewer or other conduit	Not applicable
S21(g)	Disposing of waste in a manner which may detrimentally impact on a water resource	Typically, the conservancy tanks at construction camps and then O/M buildings require a license (GA if volumes are below 5000 m^3 noting that GA (Government Notice 665, 6 September 2013 in GG 36820) has expired 30.8.2018.
S21(h)	Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process	Not applicable
S21(i)	Altering the bed, banks, course or characteristics of a watercourse	Yes - several new crossings of watercourses will be required. A GA process can potentially be followed.
S21(j)	Removing, discharging or disposing of water found underground for the continuation of an activity or for the safety of persons	Not applicable
S21(k)	Using water for recreational purposes	Not applicable

2.8 National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)

2.8.1 Threatened or Protected Species List, 2015

Amendments to the Threatened or Protected Species (TOPS) list were published on 31 March 2015 in Government Gazette No. 38600 and Notice 256 of 2015. Certain flora and fauna that occur on the site may be threatened or protected.

2.8.1.1 Permit Requirements

A clearing and translocation permit would be required from DENC before construction commences. A preconstruction walk-through would be required to inform the permit application. In addition, if there are any nationally protected trees within the development footprint a destruction permit from DAFF would also be required. Both *Acacia erioloba* and *Boscia albitrunca* are present at the site and could potentially be affected. The provincially protected tree species *Boscia foetida* subsp. *foetida* and *Aloidendron dichotomum* are also present within the site and may be impacted. As the footprint of the power line is more flexible and the exact position of the pylons would only be determined at a later stage, it is assumed that the majority of protected species within the power line corridors could be avoided at the preconstruction stage following a walk-through of the final route and micro-siting of the final pylon positions.

2.8.2 Alien and Invasive Species Regulations, 2016

The Act and Regulations set out various degrees of Invasive Species (Plants, Insects, Birds, Animals, Fish and Water Plants) and requires that certain of those invasive species are documented and, in some cases, removed from properties in South Africa.

The Regulations list 4 categories of invasive species that must be managed, controlled or eradicated from areas where they may cause harm to the environment.

2.9 Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009)

This Act was developed to protect both animal and plant species which warrant protection and to facilitate the sustainable use of natural resources. The provincial environmental authority is responsible for the issuing of permits in terms of this legislation.

2.10 Astronomy Geographic Advantage Act, 2007 (Act. 21 of 2007)

The Act provides for the preservation and protection of areas within the Republic that are uniquely suited for optical and radio astronomy. The Square Kilometre Array radio telescope is located in the declared Karoo Central Advantage Array and as such it is protected against harmful interference from wireless communication and electromagnetic emissions from electrical equipment.

2.11 Additional Relevant Legislation

The applicant must also comply with the provisions of other relevant national legislation. Additional relevant legislation that has informed the scope and content of this EIA Report includes the following:

- *Constitution of the Republic of South Africa, 1996 (Act No. 108, 1996);*
- *Aviation Act, 1962 (Act No. 74, 1962);*
- *National Environmental Management: Waste Act, 2008 (Act No. 59, 2008);*
- *National Forest Act, 1998 (Act No. 84, 1998);*
- *National Environmental Management: Protected Areas Act, 2003(Act No. 57, 2003);*
- *National Roads Act, 1998 (Act No. 7, 1998)*
- *Occupational Health and Safety Act, 1993 (Act No. 85 of 1993);*
- *National Veld and Forest Fire Bill of 10 July 1998;*
- *Fertiliser, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No. 36 of 1947;*
- *Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002); and*
- *Independent Communications Authority of South Africa Act, 2000 (Act No. 13 of 2000; as amended).*

2.12 Conventions and Treaties

2.12.1 The Paris Agreement (2016)

South Africa is one of 195 countries that are signatory to The Paris Agreement. The Paris Agreement is a legally binding instrument within the United Nations Framework Convention on Climate Change (UNFCCC) that provides guidance for action on climate change, focusing on sustainable development and poverty eradication. It sets the goal of preventing increase in global average temperature to below 2 degrees Celsius and pursuing efforts to limit global temperature increase to 1.5 degrees Celsius. Minister of Environmental Affairs Ms Edna Molewa signed the Paris Agreement on Climate Change on behalf of South Africa on 22 April 2016.[4]

The proposed WEF fits the emission reduction targets of the Paris Agreement and its aim of sustainable development.

2.12.2 The Convention on Biological Diversity (CBD) (1993)

This is a multilateral treaty for the international conservation of biodiversity, the sustainable use of its components and fair and equitable sharing of benefits arising from natural resources. Signatories have the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.

The convention prescribes that signatories identify components of biological diversity important for conservation and monitor these components in light of any activities that have been identified which are likely to have adverse impacts on biodiversity. The CBD is based on the precautionary principle which states that where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimise such a threat and that in the absence of scientific consensus the burden of proof that the action or policy is not harmful falls on those proposing or taking the action.

2.12.3 The Ramsar Convention (1971)

The Convention on Wetlands, called the Ramsar Convention, as it was adopted in the Iranian city of Ramsar in 1971 and came into force in 1975, is an intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources. Under the three pillars of the convention the Contracting Parties commit to work towards the wise use of all their wetlands through national plans, policies and legislation, management actions and public education; designate suitable wetlands for their list of Wetlands of International Importance (the "Ramsar List") and ensure their effective management; and Cooperate internationally on transboundary wetlands, shared wetland systems, shared species, and development projects that may affect wetlands.

2.12.4 The Convention on the Conservation of Migratory Species of Wild Animals (CMS or Bonn Convention) (1983)

An intergovernmental treaty, concluded under the sponsorship of the United Nations Environment Programme, concerned with the conservation of wildlife and habitats on a global scale. The fundamental principles listed in Article II of this treaty state that signatories acknowledge the importance of migratory species being conserved and agree to take action to this end "*whenever possible and appropriate*", "*paying special attention to migratory species the conservation status of which is unfavourable and taking individually or in cooperation appropriate and necessary steps to conserve such species and their habitat*".

[4] https://www.environment.gov.za/mediarelease/southafrica_ratifies_parisagreement (accessed on 24 January 2019).

2.12.5 The Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) (1999)

An intergovernmental treaty developed under the framework of the Convention on Migratory Species (CMS), concerned with the coordinated conservation and management of migratory waterbirds throughout their entire migratory range. Signatories of the Agreement have expressed their commitment to work towards the conservation and sustainable management of migratory waterbirds, paying special attention to endangered species as well as to those with an unfavourable conservation status. The assessment of the ecology and identification of sites and habitats for migratory waterbirds is required to coordinate efforts that ensure that networks of suitable habitats are maintained and investigate problems likely posed by human activities.

2.13 Policies and Guidelines

2.13.1 Environmental Impact Assessment Guidelines

Relevant guidelines and policies as applicable to the management of the EIA process and to this application have also been taken into account, as indicated below:

- *IEM Guideline Series (Series 3): Stakeholder engagement (2002);*
- *IEM Guideline Series (Series 4): Specialist studies (2002);*
- *IEM Guideline Series (Series 5): Impact Significance (2002);*
- *IEM Guideline Series (Guideline 5): Companion to the EIA Regulations 2010 (October 2012);*
- *IEM Guideline Series (Series 7): Cumulative Effects Assessment (2002);*
- *IEM Guideline Series (Guideline 7): Public Participation in the EIA process (October 2012);*
- *IEM Guideline Series (Series 7): Alternatives in the EIA process (2002);*
- *IEM Guideline Series (Guideline 9): Draft guideline on need and desirability in terms of the EIA Regulations 2010 (October 2012);*
- *DEA (2017) Guideline on Need and Desirability, Department of Environmental Affairs (DEA) Pretoria, South Africa (2017);*
- *IEM Guideline Series (Series 12): Environmental Management Plans (EMP) (2002); and*
- *IEM Guideline Series (Series 15): Environmental impact reporting (2002).*

2.13.2 The Equator Principles (EPs) III, 2013

The principles applicable to the project are likely to include:

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

These principles, among various requirements, include a requirement for an assessment process and an Environmental and Social Management Plan (ESMP) to be prepared by the client to address issues raised in the assessment process and incorporate actions required to comply with the applicable standards, and the appointment of an independent environmental expert to verify monitoring information.

2.13.3 South African Wind Energy Facility Guidelines

The following guidelines are relevant to the proposed WEF and the potential impacts they may have on bats/avifauna and habitat that support bats/avifauna:

- South African Good Practise Guidelines for Surveying Bats in Wind Energy Facility Developments – Pre-Construction. Fourth Edition: 2016;
- South African Good Practise Guidelines for Operational Monitoring for Bats at Wind Energy Facilities (2014);
- Birds and Wind-Energy Best-Practice Guidelines: Best-Practice Guidelines for assessing and monitoring the impact of wind-energy facilities on birds in southern Africa. Third Edition, 2015 (previous versions 2011 and 2012); and
- Verreaux's Eagle and Wind Farms: Guidelines for impact assessment, monitoring, and mitigation (March 2017).

2.13.4 Noise Standards

2.13.4.1 National

Four South African Bureau of Standards (SABS) scientific standards are considered relevant to noises from a Wind Energy Facility. They are:

- SANS 10103:2008. 'The measurement and rating of environmental noise with respect to annoyance and to speech communication';
- SANS 10210:2004. 'Calculating and predicting road traffic noise';
- SANS 10328:2008. 'Methods for environmental noise impact assessments'; and
- SANS 10357:2004. 'The calculation of sound propagation by the Concave method'.

The relevant standards use the equivalent continuous rating level as a basis for determining what is acceptable. The levels may take single event noise into account, but single event noise by itself does not determine whether noise levels are acceptable for land use purposes. The recommendations that the standards make are likely to inform decisions by authorities, but non-compliance with the standards will not necessarily render an activity unlawful *per se.*

2.13.4.2 International

Due to the lack of local regulations specifically relevant to wind energy facilities, these guidelines will also be considered during the determination of the significance of noise impacts.

ETSU-R-97

In the UK, Guidance on the assessment of noise from wind turbines is provided by ETSU-R-97 *The Assessment and Rating of Noise from Wind Turbines*.

Both ambient noise and noise from wind turbines typically vary with wind speed. According to ETSU-R-97, wind farm noise assessments should therefore consider the site-specific relationship between wind speed and background noise, along with the particular noise emission characteristics of the proposed wind turbines.

The IOA Good Practice Guide

The Good Practice Guide (GPG) was published by the UK Institute of Acoustics (IOA) in May 2013 and has been endorsed by the UK Government as current industry good practice. The guide presents current good practice in the assessment of wind turbine developments at the various stages of the assessment process.

During the development of the GPG, a detailed study was undertaken of wind farm noise propagation and prediction methods used in a number of countries.

Guidelines for Community Noise (Word Health Organisation, 1999)

The World Health Organization's (WHO) document on the Guidelines for Community Noise is the outcome of the WHO- expert task force meeting held in London, United Kingdom, in April 1999. It is based on the document entitled "Community Noise" that was prepared for the World Health Organization and published in 1995 by the Stockholm University and Karolinska Institute.

The scope of the WHO's effort to derive guidelines for community noise is to consolidate actual scientific knowledge on the health impacts of community noise and to provide guidance to environmental health authorities and professionals trying to protect people from the harmful effects of noise in non-industrial environments.

Guidance on the health effects of noise exposure of the population has already been given in an early publication of the series of Environmental Health Criteria. The health risk to humans from exposure to environmental noise was evaluated and guidelines values derived. The issue of noise control and health protection was briefly addressed.

The document uses the LAeq and LA,max descriptors to define noise levels with the instrument likely using the "Fast"-time weighting. This document was important in the development of the SANS 10103 standard.

The Assessment and Rating of Noise from Wind Farms (1997)

This report describes the findings of a Working Group on Wind Turbine Noise, facilitated by the United Kingdom Department of Trade and Industry. It was developed as an Energy Technology Support Unit[5] (ETSU) project. The aim of the project was to provide information and advice to developers and planners on noise from wind turbines. The report represents the consensus view of a number of experts (experienced in assessing and controlling the environmental impact of noise from wind farms). Their findings can be summarised as follows:

1. Absolute noise limits applied at all wind speeds are not suited to wind farms; limits set relative to the background noise (including wind) are more appropriate.
2. $L_{A90,10mins}$ is a much more accurate descriptor when monitoring ambient and turbine noise levels.
3. The effects of other wind turbines in a given area should be added to the effect of any proposed wind energy facility, to calculate the cumulative effect.
4. Noise from a wind energy facility should be restricted to no more than 5 dBA above the current ambient noise level at a NSD. Ambient noise levels is measured on-site in terms of the $L_{A90,10min}$ descriptor for a period sufficiently long enough for a set period.
5. Wind farms should be limited to within the range of 35 dBA to 40 dBA (day-time) in a low noise environment. A fixed limit of 43 dBA should be implemented during all night time noise environments. This should increase to 45 dBA (day and night) if the NSD has financial investments in the wind energy facility.
6. A penalty system should be implemented for wind turbine/s that operates with a tonal characteristic.

[5] ETSU was set up in 1974 as an agency by the United Kingdom Atomic Energy Authority to manage research programmes on renewable energy and energy conservation. The majority of projects managed by ETSU were carried out by external organizations in academia and industry. In 1996, ETSU became part of AEA Technology plc which was separated from the UKAEA by privatisation.

This is likely the guideline used in the most international countries to estimate the potential noise impact stemming from the operation of a wind energy facility. It also recommends an improved methodology (compared to a fixed upper noise level) on determining ambient sound levels in periods of higher wind speeds, critical for the development of a wind energy facility.

The document uses the $L_{Aeq,f}$ and L_{A90} descriptors to define noise levels using the "Fast"-time weighting.

Noise Guidelines for Wind Farms (MoE, 2008)[6]

This document establishes the sound level limits for land-based wind power generation facilities and describes the information required for noise assessments and submissions under the Environmental Assessment Act and the Environmental Protection Act, Canada (Table 2.2).

The document defines:

- Sound Level Limits for different areas (similar to rural and urban areas), defining limits for different wind speeds at 10 m height; and
- The Noise Assessment Report, including:
  - Information that must be part of the report;
  - Full description of noise sources;
  - Adjustments, such as due to the wind speed profile (wind shear);
  - The identification and defining of potential sensitive receptors;
  - Prediction methods to be used (ISO 9613-2);
  - Cumulative impact assessment requirements;
  - It also defines specific model input parameters;
  - Methods on how the results must be presented; and
  - Assessment of Compliance (defining magnitude of noise levels).

Table 2.2: Summary of Sound Level Limits for Wind Farms (MoE)

Wind speed (m/s) at 10 m height	4	5	6	7	8	9	10
Wind Turbine Sound Level Limits, Class 3 Area, dBA	40	40	40	43	45	49	51
Wind Turbine Sound Level Limits, Class 1 & 2 Areas, dBA	45	45	45	45	45	49	51

The document used the $L_{Aeq,1h}$ noise descriptor to define noise levels. It is not clear whether the instrument must be set to the "Fast" or "Impulse" time weighing setting, but, as the "Fast" setting is used in most international countries it is assumed that the instrument will be set to the "Fast" setting.

It should be noted that these Sound Level Limits are included for the reader to illustrate the criteria used internationally. Due to the lack of local regulations specifically relevant to wind energy facilities this criteria will also be considered during the determination of the significance of the noise impact.

[6] Noise Guidelines for Wind Farms Interpretation for Applying MOE NPC Publications to Wind Power Generation Facilities Ministry of the Environment, Ontario, October 2008.

3 METHODOLOGY

3.1 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.

The primary objective of the EIA process 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.

In terms of legal requirements, NEMA EIA Regulations 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 3.1 shows how and where the legal requirements are addressed in this EIA Report. Volume II of this Report contains the PPP undertaken to date. Comments received on the Draft Report have been collated and included in the comments and response report (Volume II).

The EIA Report presents a summary of the findings and recommendations of all specialists (full specialist reports are contained in Volume III).

The EIA Phase must be undertaken in line with the approved plan of study for environmental impact assessment. The environmental impacts, mitigation and closure outcomes as well as the residual risks of the proposed activity must be set out in the EIAR.

As per the EIA Regulations 2014, as amended, '*the objective of the environmental impact assessment process is to, through a consultative process -*

(a) determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
(b) describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the development footprint on the approved site as contemplated in the accepted scoping report;
(c) identify the location of the development footprint within the approved site as contemplated in the accepted scoping report based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
(d) determine the:
(i) nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
(ii) degree to which these impacts –
(aa) can be reversed;
(bb) may cause irreplaceable loss of resources, and
(cc) can be avoided, managed or mitigated;
(e) identify the most ideal location for the activity within the development footprint of the approved site as contemplated in the accepted scoping report based on the lowest level of environmental sensitivity identified during the assessment;

(f) identify, assess, and rank the impacts the activity will impose on the development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity;
(g) identify suitable measures to avoid, manage or mitigate identified impacts; and
(h) identify residual risks that need to be managed and monitored.'

The above activities are completed through consultation with:

- The lead authorities involved in the decision-making for the EIA application (in this case, the DEA);
- The public, I&APs and other relevant organisations to ensure that local issues are well understood; and
- The EIA specialist team to ensure that technical issues are identified.

The existing environment within which a proposed development is to be located is investigated, through a review of relevant background literature and ground-truthing.

A primary objective during this phase is to present key stakeholders with the findings of the assessments, obtain and document feedback and address all issues raised.

Table 3.1: Legislative Requirements for Scope of Assessment and Content of Environmental Impact Assessment Reports

Appendix 3 Requirements of the NEMA EIA Regulations 2014 as amended	Location in EIA
details of- *(i) the EAP who prepared the report; and* *(ii) the expertise of the EAP, including a curriculum vitae;*	Section 1.6 Appendix A
the location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including- *(i) the 21 digit Surveyor General code of each cadastral land parcel;* *(ii) where available, the physical address and farm name;* *(iii) where the required information in items (i) and (ii) is not available, the co-ordinates of the boundary of the property or properties;*	Table A Figure 1.1 Table 7.1
a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is- *(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or* *(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;*	Figure 7.1 Table 7.1
a description of the scope of the proposed activity, including- *(i) all listed and specified activities triggered and being applied for; and* *(ii) a description of the associated structures and infrastructure related to the development;*	Table 2.1 Section 7
a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	Section 2 Section 5
a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Section 5
a motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Section 6

Appendix 3 Requirements of the NEMA EIA Regulations 2014 as amended	**Location in EIA**
a full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including: *(i) details of the development footprint alternatives considered;*	Section 6
(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Section 4 Volume III
(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	Section 4
(iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 8
(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- *(aa) can be reversed;* *(bb) may cause irreplaceable loss of resources; and* *(cc) can be avoided, managed or mitigated;*	Section 8
(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;	Section 3.3 Volume II: Specialist Reports
(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 8
(viii) the possible mitigation measures that could be applied and level of residual risk;	Section 8
(ix) if no alternative development footprints were investigated, the motivation for not considering such; and	Section 6
(x) a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report;	Section 6
a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred development footprint within the approved site as contemplated in the accepted scoping report through the life of the activity, including - *(i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and* *(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;*	Section 6 Section 7
an assessment of each identified potentially significant impact and risk, including- *(i) cumulative impacts;* *(ii) the nature, significance and consequences of the impact and risk;* *(iii) the extent and duration of the impact and risk;* *(iv) the probability of the impact and risk occurring;* *(v) the degree to which the impact and risk can be reversed;* *(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and* *(vii) the degree to which the impact and risk can be mitigated;*	Section 8
where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report;	Section 8

Appendix 3 Requirements of the NEMA EIA Regulations 2014 as amended	**Location in EIA**
an environmental impact statement which contains- *(i) a summary of the key findings of the environmental impact assessment;* *(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and* *(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;*	Section 11 Figure 11.1
based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	Section 11 Appendix B: EMPr
the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	Section 8 Appendix B: EMPr
any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Section 11.3
a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section 1.8 Volume II: Specialist Reports
a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Section 11
where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;	Section 13 Table 13
an undertaking under oath or affirm(s)ation by the EAP in relation to- *(i) the correctness of the information provided in the reports;* *(ii) the inclusion of comments and inputs from stakeholders and I&APs;* *(iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and* *(iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties; and*	Appendix A
where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	n/a
An indication of any deviation from the approved scoping report, including the plan of study, including- *(i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and* *(ii) a motivation for the deviation;*	n/a
any specific information that may be required by the competent authority; and	Section 1.2
any other matters required in terms of section 24(4)(a) and (b) of the Act.	n/a

3.2 Specialist Methodology

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.

3.2.1 Geology, Soils and Agriculture

A field investigation was not considered necessary. The assessment was based on a desktop analysis of existing soil and agricultural potential data and other data for the site, which is considered adequate for a thorough assessment of all the agricultural impacts of the proposed development. A detailed soil survey is only appropriate for a significant footprint of impact on arable land. However, the area in which the development is proposed is of extremely low land capability and severely limited by climatic moisture availability, so that there is no potentially arable land in the area. In such an environment, even where soils suitable for cultivation may occur, they cannot be cultivated because of the aridity constraints.

The following sources of information were used:

- Soil data was sourced from the land type data set, of the Department of Agriculture, Forestry and Fisheries. This data set originates from the land type survey that was conducted from the 1970's until 2002. It is the most reliable and comprehensive national database of soil information in South Africa and although the data was collected some time ago, it is still entirely relevant as the soil characteristics included in the land type data do not change within time scales of hundreds of years.
- Land capability data was sourced from the 2017 National land capability evaluation raster data layer produced by the Department of Agriculture, Forestry and Fisheries, Pretoria.
- Rainfall and temperature data was sourced from The World Bank Climate Change Knowledge Portal, dated 2015.
- Grazing capacity data was sourced from Cape Farm Mapper.
- Satellite imagery of the site and surrounds was sourced from Google Earth.

Land capability (DAFF 2017) is defined as the combination of soil, climate and terrain suitability factors for supporting rainfed agricultural production. It is an indication of what level and type of agricultural production can sustainably be achieved on any land. The higher land capability classes are suitable as arable land for the production of cultivated crops, while the lower suitability classes are only suitable as non-arable grazing land, or at the lowest extreme, not even suitable for grazing. Land capability mapping divides land into 15 different categories with 1 being the lowest and 15 being the highest. Values of below 8 are generally not suitable for production of cultivated crops.

The potential impacts of the Paulputs WEF and Grid Connection identified in this specialist study were assessed based on the criteria and methodology common to the whole impact assessment. The ratings of impacts were based on the specialist's knowledge and experience of the field conditions of the environment in which the proposed development is located, and of the impact of disturbances on that agricultural environment.

3.2.1.1 Geo-technical investigation

The DEA has requested a geo-technical study of the WEF site be conducted with the following objectives:

- Identification of regional and local geological conditions;
- Review of site topography and climate and their influence on rock decomposition and subsequent soil formation;
- Provide insight into the perceived geotechnical conditions of the site (viz. foreseeable soil formations, depth and quality of underlying rockmass);
- Identify any inherent fatal flaws that may impact the proposed development, with respect to the geology and geotechnical conditions that are expected on the site; and
- Comment on the feasibility of the wind farm development from a geotechnical perspective.

The following methodology was adopted to realise the objectives of the investigation:

- Review of available geological records including 1:250 000 geological maps and 1:50 000 topographic sheets;
- Evaluation of SMEC's geotechnical database of projects conducted near the site and within similar geotechnical zonations/ geological sequences;
- Review and assessment of appropriate geotechnical/ geological references to assess the anticipated conditions of the proposed site.

The following standard practice codes and guideline documents in performing this investigation were used:

- Site Investigation Code of Practice. SAICE Geotechnical Division (2010)
- Eurocode 7: Geotechnical Design Part 1: General Rules. European Committee for Standardisation (2004)
- Probability of Risk of Slope Failure. Silva et al (2008)

To reduce the probability of failure of the proposed wind turbine structures at Paulputs, preliminary and detailed geotechnical field and laboratory work will be required for engineering design. This will be conducted if Environmental Authorisation is granted and the project achieved preferred buffer status. Therefore no further Geotechnical Evaluation was undertaken during the EIA process.

3.2.2 Freshwater and Wetlands

This study followed the approaches of several national guidelines with regards to wetland assessment. These have been modified by the author, to provide a relevant mechanism of assessing the present state of the study systems, applicable to the specific environment and in a clear and objective manner, assess the potential impacts associated with the proposed development site based on information collected within the relevant farm portions over a number of years for this and other proposed projects. The survey adhered to the assessment criteria contained in the DWAF 2005 / 2008 delineation manuals and the National Wetland Classification System.

The study included delineating any natural waterbodies on the Paulputs WEF and Grid Connection as well as assessing the potential consequences of the proposed layout on the surrounding watercourses. This was based on information collected during various site visits conducted within the region in late May 2010, July 2014, April 2016, and October 2018, which coincided with various rainfall and growth periods within the region. A follow up visit was also conducted in April 2019, to ascertain the impact the long period of drought has had on the region.

Currently there are no formalised riverine or wetland buffers distances provided by the provincial authorities and as such the buffer model as described Macfarlane *et al.*, 2017 wetlands, rivers and estuaries was used. These buffer models are based on the condition of the waterbody, the state of the remainder of the site, coupled to the type of development, as well as the proposed alteration of hydrological flows. Based on the information known for the site the buffer model provided the following:

- Construction period: 45 m
- Operation period: 35 m
- Final: 45m

However, as some rivers within the study area have been highlighted as Critical Biodiversity Areas (CBA1 & 2) per the Northern Biodiversity CBA map (Holness & Oosthuizen, 2016) the buffer of 45 m on all watercourses is applied.

3.2.3 Flora and Terrestrial Fauna

Several site visits with associated field assessments as well as a desktop review of the available ecological information for the area was conducted in order to identify and characterise the ecological features of the site. This information is used to derive an ecological sensitivity map which has been used to guide development at the site as well as set limits of acceptable change associated with the development.

This study was conducted according to the 2017 EIA Regulations (Government Notice Regulation 326) in terms of the National Environmental Management Act (Act 107 of 1998) as amended (NEMA), as well as best-practice guidelines and principles for biodiversity assessment as outlined by Brownlie (2005) and De Villiers *et al.* (2005).

The study included data searches, desktop studies, site walkovers / field surveys of the property and baseline data collection, describing the broad ecological characteristics of the site and its surrounds in terms of any mapped spatial components of ecological processes and/or patchiness, patch size, relative isolation of patches, connectivity, corridors, disturbance regimes, ecotones, buffering, viability, etc.

3.2.3.1 Pattern

3.2.3.1.1 Community and Ecosystem Level

- The main vegetation type, its aerial extent and interaction with neighbouring types, soils or topography; and
- Threatened or vulnerable ecosystems (*cf. SA vegetation map/National Spatial Biodiversity Assessment, fine-scale systematic conservation plans, etc.*).

3.2.3.1.2 Species Level

- Red Data Book (RDB) species (giving location if possible using GPS);
- The viability of an estimated population size of the RDB species that are present (include the degree of confidence in prediction based on availability of information and specialist knowledge, i.e. High=70-100% confident, Medium 40-70% confident, Low 0-40% confident); and
- The likelihood of other RDB species, or species of conservation concern, occurring in the vicinity (include degree of confidence).

3.2.3.1.3 Fauna

- Describe and assess the terrestrial fauna present in the area that will be affected by the proposed development;
- Conduct a faunal assessment that can be integrated into the ecological study;
- Describe the existing impacts of current land use as they affect the fauna;
- Clarify species of special concern (SSC) and that are known to be:
  - endemic to the region;
  - that are considered to be of conservational concern;
  - that are in commercial trade (CITES listed species); or

  - are of cultural significance.

- Provide monitoring requirements as input into the Environmental Management Plan (EMP) for faunal related issues.

3.2.3.1.4 Other Pattern Issues

- Any significant landscape features or rare or important vegetation associations such as seasonal wetlands, alluvium, seeps, quartz patches or salt marshes in the vicinity;
- The extent of alien plant cover of the site, and whether the infestation is the result of prior soil disturbance such as ploughing or quarrying (alien cover resulting from disturbance is generally more difficult to restore than infestation of undisturbed sites); and
- The condition of the site in terms of current or previous land uses.

3.2.3.2 Process

- The key ecological "drivers" of ecosystems on the site and in the vicinity, such as fire.
- Any mapped spatial component of an ecological process that may occur at the site or in its vicinity (i.e. *corridors* such as watercourses, upland-lowland gradients, migration routes, coastal linkages or inland-trending dunes, and *vegetation boundaries* such as edaphic interfaces, upland-lowland interfaces or biome boundaries).
- Any possible changes in key processes, e.g. increased fire frequency or drainage/artificial recharge of aquatic systems.
- Furthermore, any further studies that may be required during or after the EIA process will be outlined.
- All relevant legislation, permits and standards that would apply to the development will be identified.
- The opportunities and constraints for development will be described and shown graphically on an aerial photograph, satellite image or map delineated at an appropriate level of spatial accuracy.

3.2.3.3 Sources of Literature, Site Visit & Field Assessment

Data sources from the literature consulted and used where necessary in the study included for vegetation, ecosystem and fauna.

A preliminary, Scoping Phase site visit occurred over 9 - 11 November 2018. Follow-up EIA-phase site visits took place on the 24th of February 2019 as well as the 5th and 6th of April 2019 as well as the 1st and 2nd of June 2019. The different biodiversity features, habitat, and landscape units present at the site were identified and mapped in the field.

Walk-through-surveys were conducted within representative areas across the different habitat units identified and all plant and animal species observed were recorded. Additional information on faunal presence was collected through searches within areas likely to harbour reptiles and through casual observation. A total of 13 camera traps were also put out across the site during the initial site visit and were retrieved during the final site visit. Numerous site visits have also been conducted to the adjacent properties around the Paulputs substation and information from this area is also used to inform the current study where appropriate.

An ecological sensitivity map of the site was produced by integrating the results of the site visit with the available ecological and biodiversity information in the literature and various spatial databases. The ecological sensitivity of the different units was rated according to a scale (Table 3.2) which also indicates limits of acceptable change. This refers to the extent of on-site habitat loss (in %) within each sensitivity category that is considered acceptable. This provides a guide for the developer in terms of ensuring that the spatial distribution of impacts associated with a layout is appropriate with respect to the sensitivity of the site.

In addition, it provides a benchmark against which impacts can be assessed and represents an explicit threshold that when exceeded indicates that potentially unacceptable impacts may have occurred. In terms of this latter criterion, exceeding the limits of acceptable change for either High or Very High sensitivity areas is considered to represent an immediate fatal flaw. The limits within either Low or Medium sensitivity areas could potentially be exceeded, provided that the total footprint in these two areas combined does not exceed the overall combined acceptable loss within these classes. However, in the latter case, this would raise significant concern regarding the suitability of the development.

Table 3.2: Site Sensitivity Categories

Sensitivity	Acceptable Loss	Description
Low	10%	Units with a low sensitivity where there is likely to be a low impact on ecological processes and terrestrial biodiversity. This category represents transformed or natural areas where the impact of development is likely to be local in nature and of low significance with standard mitigation measures.
Medium	5%	Areas of natural or previously transformed land where the impacts are likely to be largely local and the risk of secondary impacts such as erosion low. Development within these areas can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken.
High	2%	Areas of natural or transformed land where a high impact is anticipated due to the high biodiversity value, sensitivity or important ecological role of the area. Development within these areas is undesirable and should only proceed with caution as it may not be possible to mitigate all impacts appropriately.
Very High/ No-Go	Zero Loss	Critical and unique habitats that serve as habitat for rare/endangered species or perform critical ecological roles. These areas are essentially no-go areas from a developmental perspective and should be avoided as much as possible. Where these features need to be traversed, existing roads or disturbance footprints should be used.

3.2.4 Avifauna

The approach to the study followed that which was required by the Best Practice Guidelines applicable at the time of the surveys (Jenkins *et al.* 2015) ('the guidelines') and those of the National Environment Management Act, 1998 (Act No 107 of 1998), as amended and the NEMA EIA Regulations 2014, as amended.

The baseline avifauna environment for the WEF site was defined utilising a desk-based study and informed by four seasons of on-site pre-construction bird monitoring conducted to date. This information was examined to determine the potential location and abundance of avifauna which may be sensitive to development, and to understand their conservation status and sensitivity.

The following sources of information were used for the Avifaunal Impact Assessment Report (AIAR):

- Bird distribution data of the Southern African Bird Atlas Project (SABAP-1) (Harrison *et al.* 1997) and Southern African Bird Atlas Project 2 (SABAP-2) obtained from the Avian Demography Unit of the University of Cape Town (Brooks 2017);
- Co-ordinated Avifaunal Road Count (CAR) project (Taylor *et. al.* 1999)
- Co-ordinated Water-bird Count (CWAC) project (Taylor *et. al.* 1999);
- The Important Bird Areas of southern Africa (IBA) project (Barnes 1998);

- Publicly available satellite imagery;
- The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland (Taylor *et al.* 2015);
- Results of the four seasonal surveys (autumn, winter, spring and summer) conducted for the pre-construction avifaunal monitoring programme for Paulputs WEF.
- A summary of post-construction results from eight operational wind farms in South Africa published by Birdlife SA (Ralston Paton *et al.* 2017);
- Specialist Avifaunal Assessment for the Proposed Pofadder Solar Thermal Plant, Northern cape (BLSA 2010)
- Birds Impact Review Proposed Amendment to the Environmental Authorisation for the Namies Wind farm, near Aggeneys in the Northern Cape (14/12/16/3/3/2/550/AM1). (Chris van Rooyen Consulting 2018);
- Paulputs Solar Energy Facility Initial Avifaunal Assessment (Smallie 2017)
- Avifauna Baseline and Impact Assessment report for the proposed construction of Paulputs CSP project near Pofadder, Northern Cape Province (Hudson, 2016)
- Publicly available peer reviewed literature on the effects of wind energy developments on birds.

The survey design and method was developed by Arcus to be in line with the guidelines. Consideration and implementation of these guidelines is a requirement of the Department of Environmental Affairs (DEA) for assessment of proposed WEFs.

Based on the avifaunal specialist's experience on operational WEFs in South Africa and the information gathered during the high level site screening/feasibility study conducted by Arcus, a number of important species which may have the potential to be impacted upon, may be present on or around the project site. These include, but are not limited to the following: Martial Eagle, Booted Eagle, Black-chested Snake Eagle, Pale Chanting Goshawk, Spotted Eagle-Owl, Lanner Falcon, Greater Kestrel, Rock Kestrel, Karoo Korhaan, Northern Black Korhaan, Double-banded Courser, Kori Bustard, Ludwig's Bustard, Red Lark and Sclater's Lark. The potential presence of these species was considered in the design of the survey as detailed below.

BirdLife South Africa (BLSA) released species specific Verreaux's Eagle Guidelines (VE Guidelines) (BLSA, 2017). These were considered in the design of the monitoring programme. The VE guidelines become applicable "where a wind farm is proposed within potentially important Verreaux's Eagle habitat". It was the specialist's opinion based the results of the pre-feasibility desktop study and current information[7], that the proposed site had a small chance of meeting this criterion, and the survey effort was sufficient.

To obtain data for accurate 'before-after' comparison the monitoring programme included data collection in a control area approximately 6 km from the WEF site boundary, and where no future plans for renewable energy development are known. Monitoring of the WEF site and the control site was conducted on a total of four sampling trips over a 12-month period, to be representative of the seasonal variation in environmental conditions occurring in the area. In addition a dedicated nest survey, focussing on searching for eagle nests on suitable cliffs and powerline pylons on and around the project site was conducted in July 2018, these are described in detail in the AIAR (Volume III).

Prior to the first (autumn) survey, the avifaunal specialist visited the WEF site and surrounding areas from 4 – 5 April 2018 for the 'site set up' to confirm survey locations and effort. This visit confirmed that the locations and methods used were accessible and

[7] During the four seasonal surveys no Verreaux's Eagle were recorded flying during Vantage Point observations, on Walked Transects or Driven Transects. One incidental record of a pair of Verreaux's Eagle south of the WEF site boundary was made.

suitable. The surveys included vantage point surveys, walked transects, driven transects, focal site surveys and incidental observations[8].

Landscape features such as ridges, cultivated fields, rivers and wetlands are generally known to be utilised by sensitive species and have high avifaunal sensitivity. The high avifaunal sensitivity features that were identified at the Paulputs WEF includes wetlands, dams and rivers. A 200 m buffer surrounding these features are considered high avifaunal sensitivity.

Three types of raptor nests were identified and buffered according to the sensitivity of the species to collisions and standard best practise:

- Verreaux's Eagle (3 km)
- Pale Chanting Goshawk (500 m)
- Greater Kestrel Nest (500 m)

3.2.5 Bats

3.2.5.1 Desktop Review

A desktop study of available bat locality data, literature and mapping resources was undertaken to determine the likelihood of bats being present at the proposed project. Literature was also sought to understand the current state of knowledge of wind energy-bats impacts globally. Very little published research on this regard is available for the South African context. Data sources included:

- Academic sources such as research papers and published texts;
- Information on bat activity at other nearby renewable energy developments such as from pre-construction monitoring reports, EIA Reports and EMPrs;
- Bat distribution records and maps; and
- A review of the habitats on the site to identify, if possible, habitats, roosts and features which may be associated with bats.

3.2.5.2 Field Surveys

The pre-construction monitoring was designed to monitor bat activity across the entire area of interest encompassed by the proposed WEF. The baseline environment was investigated by using acoustic monitoring to document bat activity between 23 February 2018 and 11 April 2019 (412 sample nights).

The monitoring was undertaken in accordance with South African best practice[9]. Sampling of bat activity took place at four locations using Song Meter SM3 and SM4 bat detectors (Wildlife Acoustics, Inc.). Ultrasonic microphones were mounted on masts at 12 m at each location. An additional ultrasonic microphone was also mounted at 100 m on a meteorological mast (METHigh). All detectors were configured to record every night from 30 minutes before sunset until 30 minutes after sunrise.

The distribution of monitoring locations across the site was determined based on vegetation types, land-use, and topography with the aim to sample bat activity in areas where bat activity was expected to be higher (e.g. near water and buildings, along riparian vegetation) but also in areas where bat activity was expected to be lower (e.g. away from water and buildings, in open areas with low habitat complexity).

8 Incidental observations were also recorded on the 4th and 5th of May 2018 during the site set up.

9 Sowler, S., Stoffberg, S., MacEwan, K., Aronson, J., Ramalho, R., Potgieter, K., Lötter, C. 2016. South African Good Practice Guidelines for Surveying Bats at Wind Energy Facility Developments - Pre-construction: 4th Edition. South African Bat Assessment Association. The monitoring also meets the requirements of edition 4.1 of the guidelines published in 2017.

In addition to the acoustic monitoring, potential structures that bats could use as roosts were investigated during the day for the presence or evidence of roosting bats (e.g. guano and culled insect remains, etc.) whenever the Arcus team was on site. These included buildings, rocky outcrops and trees.

3.2.5.3 Data Analysis

Bats emit ultrasonic echolocation calls for orientation, navigation and foraging. These calls can be recorded by bat detectors enabling bat species to be identified from various features in their calls (e.g. the frequency of the call). A sequence of calls is a bat pass defined as two or more echolocation calls separated from other calls by more than 500 milliseconds (Hayes 1997; Thomas 1988). Quantifying the number of bat passes recorded can be used to quantify the relative abundance of bat species.

Acoustic data from each bat detector were analysed using Kaleidoscope (Version 5.1.6, Wildlife Acoustics, Inc.). Bat species were automatically identified from their echolocation calls using the embedded echolocation call library in the software. The results were vetted by randomly or selectively (for certain species) manually identifying recordings. Most files contained only a single bat pass and therefore the total number of files was used as a proxy for the number of bat passes. This would underestimate bat activity if any files contained more than one bat pass.

3.2.6 Noise

A desk-based search was carried out to identify potential noise-sensitive developments (principally houses) within 2 km of the WEF site, using National Geo-Spatial Information 1:50,000 scale digital mapping and Google Aerial imagery.

It is of note that no specific guidance or criteria for the assessment of wind turbine noise exists in South Africa. The following South African and International guidance documents have therefore been taken into consideration:

- The National Noise Control Regulations: GN R154 of 1992 (NCR);
- SANS 10328 Methods for environmental noise impact assessments;
- SANS 10103 – provides guidance on assessing working and living environments with respect to acoustic comfort, excellence and possible annoyance by noise[10];
- The UK IOA Good Practice Guide (IOA GPG)[11];
- WHO Guidelines; and
- BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites.

3.2.6.1 Estimation of Noise Levels

Construction Phase

BS 5228 is the described method for predicting levels of noise during construction.

Operational Phase

The UK IOA Good Practice Guide (IOA GPG) for the assessment and rating of wind turbine noise at receptors.

SANS 10103 provides guidance on assessing working and living environments with respect to acoustic comfort, excellence and possible annoyance by noise. It provides information

[10] South African National Standard SANS 10103: 2006 The measurement an rating of environmental noise with respect to annoyance and speech communication, Edition 6

[11] A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of wind Turbine Noise, Institute of Acoustics (UK), May 2013

on typical indoor and outdoor noise levels in various districts and was the method used of predicting levels if wind turbine noise at receptors. These are:

- Day/night: 45 dBA, $L_{R,dn}$
- Day: 45 dBA, $L_{Req,d}$
- Night: 35 dBA, $L_{Req,n}$

3.2.6.2 Estimation of the Desired Rating Level

Construction Phase

As effects during the construction phase are temporary in nature, the likelihood of complaint is reduced in comparison to longer-term effects such as operational noise. It is therefore considered appropriate to define the desired rating level for construction noise as 10 dB above the typical district rating levels defined in SANS 10103, i.e.:

- 55 dBA during the day; and
- 45 dBA at night.

Operation Phase

Given that wind turbines emit the greatest level of noise under high winds, the use of the long-term typical district rating levels specified in SANS 10103 are considered more appropriate for this assessment than short-term ambient measurements on site, which are undertaken during calm weather, making them incompatible with the assessment of worst-case wind turbine noise levels.

Based on the guidance provided in SANS 10103, and taking into account the definition of disturbing noise in the NCR, it is considered that appropriate rating levels from noise during operation of the Development are 7 dBA above the typical district rating levels during the day (i.e. 52 dBA).

At night, a rating level of 45 dBA L_{Feq} is recommended, based upon the most stringent night-time noise limit in ETSU-R-97 of 43 dB $L_{A90,10min}$ (equivalent to 45 dBA L_{Feq}), and WHO guidelines. Given that wind turbines can operate 24-hours a day, it is considered appropriate to set an overall noise limit for the development of 45 dBA L_{Feq}.

3.2.7 Heritage, Archaeology and Palaeontology

A survey of available literature was carried out to assess the general heritage context into which the Paulputs WEF and Grid Connection would be set. This literature included published material, unpublished commercial reports and online material, including reports sourced from the South African Heritage Resources Information System (SAHRIS). The 1:250 000 maps were sourced from the Chief Directorate: National Geo-Spatial Information.

The site was subjected to a detailed foot survey on 30 November to 2 December 2018. This was in early summer but in this dry area seasonality makes no meaningful difference to the vegetation cover and hence ground visibility. The survey was done during the scoping phase and its results were used to inform the final layout to be assessed. This was done to reduce the chances of significant impacts occurring.

During the survey the positions of finds and survey tracks were recorded on a hand-held Global Positioning System (GPS) receiver set to the WGS84 datum. Photographs were taken at times in order to capture representative samples of both the affected heritage and the landscape setting of the proposed development.

Specialist palaeontological input was obtained from Dr John Almond of Natura Viva cc. Due to the generally low sensitivity of the study area this was only a desktop study.

S.7 (1) of the NHRA provides for the grading of heritage resources into those of National (Grade I), Provincial (Grade II) and Local (Grade III) significance. Grading is intended to allow for the identification of the appropriate level of management for any given heritage resource. Grade I and II resources are intended to be managed by the national and provincial heritage resources authorities respectively, while Grade III resources would be managed by the relevant local planning authority. These bodies are responsible for grading, but anyone may make recommendations for grading.

It is intended under S.7(2) that the various provincial authorities formulate a system for the further detailed grading of heritage resources of local significance but this is generally yet to happen. SAHRA (2007) has formulated its own system[12] for use in provinces where it has commenting authority. In this system sites of high local significance are given Grade IIIA (with the implication that the site should be preserved in its entirety) and Grade IIIB (with the implication that part of the site could be mitigated and part preserved as appropriate) while sites of lesser significance are referred to as having 'General Protection' (GP) and rated as GP A (high/medium significance, requires mitigation), GP B (medium significance, requires recording) or GP C (low significance, requires no further action).

3.2.8 Visual

A desktop Visual Impact Assessment (VIA) of the Paulputs WEF and Grid Connection was undertaken supported by field-based observation and the public participation process. Baseline information about the physical characteristics of the study area was initially sourced from spatial databases provided by NGI, the South African National Biodiversity Institute (SANBI) and the South African National Land Cover Dataset (Geoterraimage – 2014). The characteristics identified via desktop means were later verified during the site visit. The findings of the field assessment have been used to inform the EIA-level VIA and no further fieldwork was considered necessary

Fieldwork undertaken during the scoping phase of the VIA involved a two (2) day site visit undertaken between the 26th and the 28th of November 2018 (early summer). The purpose of the site visit was to:

- verify the landscape characteristics identified via desktop means;
- conduct a photographic survey of the study area;
- verify, where possible, the sensitivity of visual receptor locations identified via desktop means;
- eliminate receptor locations that are unlikely to be influenced by the proposed development;
- identify any additional visually sensitive receptor locations within the study area; and
- inform the impact rating assessment of visually sensitive receptor locations (where possible).

Visual receptor locations and routes identified in the study area during the scoping phase of the project were re-assessed in order to determine the impact of the amended and/or refined WEF proposals on each of the identified receptor locations.

Mitigation measures were identified (where possible) in an attempt to minimise the visual impact of the proposed development. The rating matrix, as provided by Arcus, made use of a number of different factors including severity, geographical extent, duration, consequence and probability, in order to assign a level of significance to the visual impact of the project.

A separate rating matrix was used to assess the visual impact of the proposed development on each visual receptor location (both sensitive and potentially sensitive), as identified. This

[12] The system is intended for use on archaeological and palaeontological sites only.

matrix is based on three (3) parameters, namely the distance of an identified visual receptor from the proposed development, the presence of screening factors and the degree to which the proposed development would contrast with the surrounding environment.

Continuous consultation with Interested and Affected Parties (I&APs) undertaken during the public participation process will be used (where available) to help establish how the proposed development will be perceived by the various receptor locations and the degree to which the impact will be regarded as negative.

3.2.8.1 Sensitive Visual Receptors

The identification of sensitive receptors is typically based on a number of factors which include:

- the visual character of the area, especially taking into account visually scenic areas and areas of visual sensitivity;
- the presence of leisure-based (especially nature-based) tourism in an area;
- the presence of sites or routes that are valued for their scenic quality and sense of place;
- the presence of homesteads / farmsteads in a largely natural setting where the development may influence the typical character of their views; and
- feedback from interested and affected parties, as raised during the public participation process conducted as part of the EIA study.

The degree of visual impact experienced will however vary from one inhabitant to another, as it is largely based on the viewer's perception.

The visibility of the development diminishes exponentially over distance, receptor locations which are closer to the WEF or power line corridor would experience greater adverse visual impact than those located further away. Zones of visual impact for the WEF and the grid connection infrastructure were therefore delineated based on distance bands measured from the preliminary turbine locations and the power line corridors.

Receptors WEF

Based on the height and scale of the WEF project, the distance intervals chosen for the zones of visual impact are as follows:

- 0 - 2km (high impact zone)
- 2 - 6km (moderate impact zone)
- 6 - 10km (low impact zone)

Preliminary desktop assessment of the study area during the scoping phase identified 26 potentially sensitive visual receptor locations, all of which appear to be existing farmsteads or farmhouses. This assessment was refined according to the findings of the field assessment conducted in November 2018 and seven of the identified locations were removed from the list of potentially sensitive receptors. Some of these seven locations were outside the 10km assessment zone for the WEF, while others were identified as structures not considered to be visual receptors. None of the identified receptor locations were considered to be sensitive receptors and no leisure or nature-based activities were identified in the study area.

In many cases, roads along which people travel, are regarded as sensitive receptors. The primary thoroughfare in the study area is the N14 national route. Although the section of the N14 traversing the study area does not form part of a designated tourism route, it is likely that the road is utilised, to some extent, for its tourism potential and as a result it is considered to be a potentially sensitive receptor road - i.e. a road being used by motorists who may object to the potential visual intrusion of the proposed WEF. Other thoroughfares in the study area are primarily used as local access roads and do not form part of any scenic tourist routes. These roads are not specifically valued or utilised for their scenic or tourism potential and are therefore not regarded as visually sensitive.

Receptors: Grid Connection Infrastructure

Given the length of the proposed power line and the likely height of the associated towers, the radii chosen for the zones of visual impact are as follows:

- <=500m (high impact zone)
- 500m < 2km (moderate impact zone)
- 2km < 5km (low impact zone)

With the addition of a fourth grid connection corridor option, running northwards from the WEF, the visual assessment zone for the grid connection infrastructure has extended significantly for this phase of the project. As a result, receptors identified in the extended assessment area have been included in this EIA-phase report. A total number of eleven (11) receptors have been identified within 5kms of the power line corridor options. As with the WEF receptors, these receptors appear to be existing farmsteads or farmhouses, but as they are located within a mostly rural setting, they are regarded as potentially sensitive visual receptorss.

3.2.9 Social

On the 3rd to the 5th of January 2019 a site visit to the proposed Paulputs WEF, and the surrounding towns was conducted.

The research approach or methodology followed for the development of the Social Impact Assessment (SIA) Report is based on the Guidelines for Involving Social Impact Assessment Specialists in the EIA process that was prepared for the Department of Environmental Affairs and Development Planning for the Western Cape Province of South Africa in February 2007 (Barbour, 2007), including the Guidelines and Principles for Social Impact Assessment (Inter-organizational Committee on Guidelines and Principles for Social Impact Assessment, 1994) and IAIA Guidance for Assessing and Managing Social Impacts (IAIA, 2015). These guidelines for development and planning of Social Impact Assessments (SIAs) are based on accepted international best practice guidelines. The Scoping phase involved:

- Describe and obtain a basic understanding of the proposed development (type, scale and location). Also obtain an understanding of the individuals and/or communities which are likely to be affected by the intervention, and determine the need and the scope of conducting and SIA;
- Collecting the baseline data for the proposed intervention based on the current social environment and historical social trends;
- Assess and document the significance of the social impacts which are associated with the proposed intervention; and
- Based on the baseline data and the identification and assessment of the social impacts likely to be associated with the proposed intervention, identify alternatives and mitigation measures for the social impacts of the proposed intervention (Barbour, 2007).

The identification of the preliminary potential social impacts associated with the proposed Paulputs WEF and Grid Connection is based on the review of relevant documentation and experience from previous similar projects. This research study also made use of a mixed method research approach. A mixed method research approach builds on both a quantitative and qualitative research approach. A quantitative research approach refers to answering questions about relationships amongst measured variables. The aim is to explain, predict and or control the phenomena, in order to establish, confirm and validate relationships and develop generalisations. A qualitative research approach answers questions about the complex nature of a phenomena. The aim of this approach is to describe and understand the phenomena from a participants' point of view (De Vos *et al.*, 2011). This research approach mainly relies on converting information from observations, reports and recordings into data and then into the written word.

3.2.10 Traffic and Transportation

The requirements in the TMH 16 Vol 1 & 2 South African Traffic Impact and Site Traffic Assessment Manual, August 2012, compiled by the Committee of Transport Officials (COTO) were used for the traffic study. Trip generation rates were based on the Scope of Work and the anticipated build programme.

A site visit was conducted on 24 August 2018, a normal traffic day, to assess possible routes to site and to gain insight to possible issues and constraints along the various routes, from Saldanha Port (point of origin) to the proposed WEF site (destination), and to assess the roadside and site environment from a transport perspective.

Traffic impacts resulting from other similar developments within 35 km of the site were estimated, based on previous experience of similar developments, and understanding of their cumulative impact on the subject WEF and Grid.

3.3 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 used to predict changes to existing conditions, and undertake an assessment of the impacts associated with these changes.

3.4 Assessment of Potential Effects

The potential impact that the proposed Paulputs WEF and Grid Connection 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).

Specialists, in their terms of references, were supplied with a standard method with which to determine the significance of impacts to ensure objective assessment and evaluation, while enabling easier multidisciplinary decision-making. The methodology[13] is outlined below.

The table below, taken from the abovementioned guideline, indicates the categories for the rating of impact magnitude and significance.

The assessment methodology that was used is in accordance with the revised 2014 EIA Regulations as amended. The significance of environmental impacts is a function of the environmental aspects that are present and to be impacted on, the probability of an impact occurring and the consequence of such an impact occurring before and after implementation of proposed mitigation measures.

3.4.1 Extent (spatial scale)

L	M	H
Impact is localized within site boundary	Widespread impact beyond site boundary; Local	Impact widespread far beyond site boundary; Regional/national

3.4.2 Duration

L	M	H
Quickly reversible, less than project life, short term	Reversible over time; medium term to life of project	Long term; beyond closure; permanent; irreplaceable or irretrievable commitment of resources

3.4.3 Intensity (severity)

Type of Criteria	Negative			Positive		
	H-	M-	L-	L+	M+	H+
Qualitative	Substantial deterioration death, illness or injury, loss of habitat /diversity or resource, severe alteration or disturbance of important processes.	Moderate deterioration, discomfort, Partial loss of habitat /biodiversity /resource or slight or alteration	Minor deterioration, nuisance or irritation, minor change in species/habitat/diversity or resource, no or very little quality deterioration.	Minor improvement, restoration, improved management	Moderate improvement, restoration, improved management, substitution	Substantial improvement, substitution
Quantitative	Measurable deterioration Recommended level will often be violated (e.g. pollution)	Measurable deterioration Recommended level will occasionally be violated	No measurable change; Recommended level will never be violated	No measurable change; Within or better than recommended level.	Measurable improvement	Measurable improvement

[13] Adapted from T Hacking, AATS – Envirolink, 1998: An innovative approach to structuring environmental impact assessment reports. In: IAIA SA 1998 Conference Papers and Notes.

3.4.4 Probability of Occurrence

L	M	H
Unlikely; low likelihood; Seldom No known risk or vulnerability to natural or induced hazards.	Possible, distinct possibility, frequent Low to medium risk or vulnerability to natural or induced hazards.	Definite (regardless of prevention measures), highly likely, continuous High risk or vulnerability to natural or induced hazards.

3.4.5 Status of the Impact

The specialist should describe whether the impact is positive, negative or neutral for each parameter. The ranking criteria are described in negative terms. Where positive impacts are identified, use the opposite, positive descriptions for criteria.

3.4.6 Degree of Confidence in Predictions:

The degree of confidence in the predictions, based on the availability of information and specialist knowledge, is to be stated.

3.4.7 Consequence: (Duration x Extent x Intensity)

Having ranked the severity, duration and spatial extent, the overall consequence of impacts is determined using the following qualitative guidelines:

Intensity = L				
Duration	**H**			
	M			Medium
	L	Low		
Intensity = M				
Duration	**H**			High
	M		Medium	
	L	Low		
Intensity = H				
Duration	**H**			
	M			High
	L	Medium		
		L	M	H
		Extent		

Positive impacts are ranked in the same way as negative impacts, but result in high, medium or low positive consequence.

3.4.8 Overall Significance of Impacts

Combining the consequence of the impact and the probability of occurrence provides the overall significance (risk) of impacts.

PROBABILITY	**Definite Continuous**	H	MEDIUM		HIGH
	Possible Frequent	M		MEDIUM	
	Unlikely Seldom	L	LOW		MEDIUM
			L	M	H
			CONSEQUENCE (from Table 5)		

3.4.9 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 relocating turbines 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 and enhancement measures (where relevant).

3.5 Cumulative Impact Assessment

In accordance with the EIA Regulations, consideration is also given to cumulative impacts.

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.

For the purpose of this assessment cumulative impacts is defined and has been assessed in the future baseline scenario, i.e. cumulative impact of the proposed development = change caused by proposed development when added to the cumulative baseline. The cumulative baseline includes all other identified developments. In the cumulative assessment the effect of adding the proposed development to the cumulative baseline is assessed.

In line with best practice, the scope of this assessment will include all operational, approved or current and planned renewable energy applications (including those sites under appeal), within a 35 km radius of the site.

The renewable energy sites included in the assessment of cumulative impacts has been based on the knowledge and status of the surrounding areas at the time of finalising the EIA Report.

Eleven renewable energy projects were identified within a 35 km radius of the proposed Paulputs WEF and Grid Connection. It is assumed that all of these renewable energy developments include grid connection infrastructure. All renewable energy projects within 35 km are listed in Table 3.3 below.

Table 3.3: Renewable energy developments proposed within a 35 km radius of Paulputs WEF

Development	Current status of EIA/development	Technology	Capacity
KaXu Solar One SEF	In operation	Solar	100MW
Khoi-Sun SEF	EIA approved	Solar	75MW
Konkoonsies SEF	In operation	Solar	20MW
Konkoonsies II SEF	Construction underway	Solar	75MW
Paulputs PV 1 SEF	EIA approved	Solar	100MW
Paulputs PV 2 SEF	EIA approved	Solar	100MW
Paulputs PV 3 SEF	EIA approved	Solar	100MW
Skuitdrift SEF	EIA approved	Solar	10MW
Southern Cross SEF	EIA underway	Solar	20MW
Tutwa SEF	EIA underway	Solar	20MW
!Xina Solar One SEF	In Operation	Solar	100MW

All of these projects are Solar Energy Facilities and as such are expected to have different impacts when compared to WEF projects. These renewable energy developments are however relevant as they influence the various specialist cumulative impact assessments for the proposed development.

Each of the specialists used existing publicly available information for the developments that occur within 35 km of the proposed Paulputs WEF, in order to assess the cumulative impacts. It should be noted that this assessment is qualitative and based on specialists' knowledge. Depending on the specialist study this 35 km radius was increased to determine the full extent of cumulative impacts.

4 PUBLIC PARTICIPATION PROCESS

The first stage of public consultation was undertaken during the initial notification phase. Advertisements were placed in the local *Gemsbok* newspaper and provincial *Die Burger* newspaper; site notices were erected on the site and written notices were sent out to the affected landowners, surrounding landowners and occupiers of the site as well as to key stakeholders and organ of state. The objective of this phase 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 is important for the formulation of a plan of study and to allow the public to register as I&APs. Following the initial phase, notification letters were sent out to all I&APs during the scoping phase. All issues raised during the initial and scoping phase has been taken into consideration and included in the EIA report. Volume II contains the Comments and Response Report which addresses all Interested and Affected Parties (I&APs) comments received to date.

The primary aims of the public participation process (PPP) are:

- To inform 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 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 the comments and responses report.

4.1 EIA Phase Public Participation

During the EIA phase the following tasks were undertaken for public participation:

- Notification letters sent out to registered I&APs, key stakeholders, and organs of state to inform them of the availability of the Draft Environmental Impact Assessment Report (DEIAR) for review and comment (30 days);
- The Comments and Reponses Report was updated, recording comments and/or queries received and the responses provided;
- Notification letters to all registered I&APs, key stakeholders, and organs of state to inform them of the decision by the DEA and the appeal procedure; and
- Placement of advertisements in the same local and regional newspapers to inform I&APs of the decision taken by the DEA.

Focus Group Meetings or One-on-One meetings shall be held if necessary, during the EIA phase. Due to the nature and relatively few comments received from I&APs no public or focus group meeting was held. Furthermore, I&APs will also be able to register on the I&AP database throughout the duration of the EIA process and registered I&APs will be informed about the progress of the application.

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.

Details of the above information is attached in a public participation report (Volume II).

4.2 Summary of Comments

Initial Scoping Phase

The main correspondence received was from I&APs requesting to be registered on the I&AP database. Comments from stakeholders were information requests and only two comments were received, from SARAO, stating that they do not object the project at the current stage, however, would like to be kept informed of the developments with this project and C. Greeff, an occupier, who called concerning stock theft increasing on the property and requested to be included as an I&AP on the database. SARAO was responded to and the email from C. Greeff will be further assessed and responded to in the EIA phase.

Draft Scoping Phase

During the 30 day comment period for the Draft Scoping Report four comments were received, including comment from the DEA (addressed in Section 1.8 of Volume I: Final Scoping Report) and the Department of Water and Sanitation (DWS), Northern Cape (addressed in Volume II: Comments and Responses Trail). I&APs and Stakeholders requested more information and / or to be registered as an I&AP on the database. SAROA provided comment raising concerns that no reference has been made to the SKA radio telescope and the mitigation measures that should be in place to ensure that the telescope is protected from electromagnetic interference that is radiated from the facility. SARAO requested a commitment from the developer to ensure that the radiated emissions does not exceed the SARAS protection levels at the nearest SKA telescope. The South African Heritage Resources Agency (SAHRA) provided Interim Comment requesting that the Palaeontological Impact Assessment (PIA) be submitted at the beginning of the Public Review period for the Draft EIA Report; and that a turbine buffer of 3 km is applied to the N14.

Final Scoping Phase

Following submission of the Final Scoping Report several comments were received from I&APs. DEA: Integrated Environmental Authorisations provided Acknowledgement of Receipt and Comment on the Final Scoping Report (responded to in Volume I Draft EIA Report Section 1.2 Table 1.1). All other comments received are addressed or responded to in Volume II Section 4 Comments and Responses Trail (Table 1: Comments and Responses, above). Included are comments from the DEA: Biodiversity Conservation, requesting amongst other comments that a site visit be conducted with the Northern Cape Department of Environment and Nature Conservation (DENC) after submission of the Draft EIA Report. SAHRA provided further Interim Comment stating that the 500 m no turbine buffer of the N14 is sufficient. SARAO / SKA stated that their concerns are captured appropriately in the Final Scoping Report, thus no further specialist studies (e.g. RFI / EMF studies) are required during EIA phase. Gemini Mining and Exploration (Pty) Ltd requested feedback on the mining potential of the proposed site. Liaison with Eskom and existing IPPs was undertaken by the Applicant during production of the updated site layout including grid connection options for assessment during EIA phase. This correspondence is provided in Volume II Appendix 11.

Draft EIA Phase

The Draft EIA Report was distributed for public review on the 19 July 2019. Several comments were received from I&APs within the 30 day review period up to 19 August 2019, as well as after the 30 day review period. All comments received including those received after the 30 day public review were considered, responded to and provided in Volume II of the Final EIA Report. As requested by DEA: Biodiversity Conservation at Final Scoping Phase, a site visit was conducted with DENC on the 19 August 2019. Comment received from DENC subsequent to the site visit indicated that the DENC's main concern is the presence of Protected Tree species on site - Shepherd's Tree (*Boscia* albitrunca) and Quiver Tree (*Aloidendron dichotomum*) - as well as the Red Listed Kalahari Cactus (*Hoodia gordonii*). The DEA: Biodiversity Conservation provided comment stating that they are not in-support of the development as '*part of the proposed development falls within the Critical Biodiversity Area category 1*' (CBA 1) and stated that an effective long-term monitoring programme for *Aloidendron dichotomum* is required. The Ecological Specialist confirmed that the '*CBA within the site is due to the presence of* Aloidendron dichotomum *within the CBA planning unit*' and provided guidelines for a long-term monitoring programme for *Aloidendron dichotomum* in the Fauna and Flora Impact Assessment (Volume III) and EMPr. Mitigation measures aiming to protect and conserve the endangered plant species identified on site have been provided in the Fauna and Flora Impact Assessment (Volume III) and Final EIA Report (Volume I). Additional comment was received from D.M. le Roux of Gemini Mining and Exploration (Pty) Ltd and DFM Exploration (Pty) Ltd regarding the sterilization of mineral resources - this aspect will be addressed during the Section 53 Application in terms of the MPRDA. Comment was also received from the neighbouring operational solar farms (Abengoa) with regard to dust, traffic and water. Abengoa comment was responded to and addressed in Volume II Public Participation Report Comment and Responses, Appendix 11 of Volume II, and the EMPr. The DEA: Integrated Environmental Authorisations provided comment on the Draft EIA Report on 16 August 2019 - these comments were addressed and responded to in the Final EIA Report (Volume I) Section 1.2 DEA Requirements, and Volume II Section 4 Comments and Responses.

5 NEED AND DESIRABILITY

5.1 Need and Desirability Guideline

Reference is made to the Department of Environmental Affairs (DEA) 2017 Guideline on Need and Desirability[14] 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.*"

The Need and Desirability of the proposed development has been considered in terms of the regional location and the project's cumulative impact. The guidelines pose questions that should be considered in this investigation, which are addressed in the Table 5.1 and Table 5.2 below.

[14] DEA (2017) Guideline on Need and Desirability. Department of Environmental Affairs (DEA), Pretoria, South Africa, ISBN: 978-0-9802694-4-4.

Table 5.1: Ecological Considerations of Need and Desirability for the Paulputs WEF

<table>
<tr><th colspan="4">"securing ecological sustainable development and use of natural resources"[15]</th></tr>
<tr><th colspan="2">Question</th><th>Answer</th><th>Reference</th></tr>
<tr><td colspan="2">How will this development (and its separate elements/aspects) impact on the ecological integrity of the area?</td><td>The ecological specialist study states:
Impact Statement - Paulputs WEF Development
The footprint of the Paulputs WEF is located within typical, low-sensitivity habitat with a low abundance of species of conservation concern. The post-mitigation impacts associated with the development would be of low significance. The contribution of the Paulputs WEF to cumulative impact in the area would be low and is considered acceptable. Overall, there are no specific long-term impacts likely to be associated with the development of the Paulputs WEF that cannot be reduced to an acceptable significance and no limits of acceptable change were exceeded by the development. As such, there are no fatal flaws associated with the development and no terrestrial ecological considerations that should prevent it from proceeding.
Impact Statement - Grid Connection
The Paulputs WEF grid connection options are acceptable and would generate low post-mitigation impacts on fauna and flora. There are no specific long-term impacts likely to be associated with the development of the Paulputs WEF Grid Connections that cannot be reduced to a low significance. The contribution of the power line and substation components to cumulative impact in the area would be low and is considered acceptable. As such, there are no fatal flaws associated with the development and no terrestrial ecological considerations that should prevent it from proceeding.</td><td>Volume III: Fauna & Flora Specialist Basic Assessment</td></tr>
<tr><td rowspan="2">How were the following ecological integrity considerations taken into account?</td><td>Threatened Ecosystems</td><td>The National List of Threatened Ecosystems (2011) was used to identify and map listed ecosystems in need of protection.
No threatened ecosystem falls within the site boundary.</td><td>Volume III: Fauna & Flora Specialist Basic Assessment</td></tr>
<tr><td>Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where</td><td>An ecological sensitivity map of the site was produced by integrating information collected on-site with available ecological and biodiversity information. Sensitive features such as wetlands, drainage lines, water bodies, steep slopes and rocky outcrops were mapped and appropriately buffered.
The proposed layout avoids all areas of high and very high ecological sensitivity.</td><td>Volume III: Fauna & Flora Specialist Basic Assessment</td></tr>
</table>

[15]Section 24 of The Constitution of South Africa refers.

"securing ecological sustainable development and use of natural resources"[15]			
Question		**Answer**	**Reference**
	they are subject to significant human resource usage and development pressure		
	Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs")	While most of the site is identified as "other natural areas" which are areas that have not been identified as being important for biodiversity conservation, there are also some ecological support areas associated with the larger drainage systems of the site as well as a large CBA 1 in the centre of the site which currently has a number of turbines in this area. Development within CBAs can have negative impacts on biodiversity pattern and process and is generally considered undesirable. It is however important to identify the reason an area is identified as a CBA as well as verify the features of potential concern in the field. Although the CBA layer does not include the underlying reasons areas have been selected as CBAs, correspondence with DENC indicates that this area has been selected as a CBA due to the presence of *Aloidendron dichotomum* on the site. This species is currently listed as Vulnerable based on the potential threat that climate change poses to the distribution of this species. *Aloidendron dichotomum* is indeed confirmed present on the site at a low density. However, this species is widespread on the site and occurs both within and outside of the CBA and the largest populations are in fact outside of the area demarcated as CBA. In this regard it is important to recognise that the CBA maps are based on the best available existing information and the *Aloidendron dichotomum* populations were likely recorded in the vicinity of the N14 and so the CBA reflects this fact rather than the actual presence of important local populations of this species. Indeed, there are large, healthy populations of this species in the area, outside of the area affected by the development. Within the site, there are occasional trees scattered very widely across the plains, but with local small concentrations some of low rocky ridges at the site as well as on the gravel plains towards the northern boundary of the site. With the appropriate avoidance, direct impact on this species can be entirely avoided. The development would however result in some habitat loss across the site. However, this is not likely to affect the local population of *Aloidendron dichotomum*. A more direct threat would likely be poaching and harvesting of young trees by construction or operational phase personnel on the site. It is also important to consider the impact that the development may have on connectivity within the CBA and the wider landscape as well as the impact that development within the CBA would have on the ability to meet vegetation and habitat targets elsewhere in the area. In this regard, the isolated nature of the CBA is significant as this indicates that the CBA's primary purpose is to protect a specific feature within the site, that being the local population of *Aloidendron dichotomum*. The CBA has not been identified as being part of a wider corridor aimed at maintaining the connectivity and functioning of the landscape. Although	Volume III: Fauna & Flora Specialist Basic Assessment

"securing ecological sustainable development and use of natural resources"[15]			
Question		**Answer**	**Reference**
		this is still an important ecological function of the landscape regardless of its' CBA status, there do not appear to be any features of major significance within the site that indicate that it is of above average significance for landscape connectivity or faunal movement through the area. Furthermore, the presence of the wind farm would not compromise most of these functions in any case as it would not prevent fauna from moving through the area. In terms of meeting targets elsewhere, the development would certainly not compromise this ability as the affected Bushmanland Arid Grassland vegetation type is widely available in the area and there are extensive areas where this target could me elsewhere and in fact probably areas with higher biodiversity value than the current site which is generally unremarkable. Overall, provided that impact on *Aloidendron dichotomum* can be avoided within the CBA and within the site more generally, development within the CBA area is considered acceptable from an ecological stand point. However, as this area still contributes to meeting targets, represents habitat for *Aloidendron dichotomum* and is currently in a moderate condition, the overall extent of the development footprint in this area should be limited. It is recommended that the footprint within the CBA should be maintained at less than 20ha as this would not be likely to have a significant negative impact on the functioning of this area. The current development footprint within the CBA is 15 ha, which is acceptable from the ecological perspective.	
	Conservation targets	The whole site lies within the Bushmanland Arid Grassland vegetation type, which is the second most extensive vegetation type in South Africa, with more than 99% of the original extent still intact. It is classified Least Threatened and considered generally low sensitivity with a low abundance of species of concern. Part of the site lies within a CBA1 and the development may impact on the biodiversity within the CBA. Furthermore, the loss of unprotected vegetation types on a cumulative basis from the broad area may impact the country's ability to meet its conservation targets. Although the receiving vegetation type in the study area is classified as Least Threatened and is still more than 98% intact, there may be other features of conservation significance in the area that may be targets for conservation. This impact is therefore assessed in light of the current development as well as any other developments in the surrounding area which would also contribute to cumulative impacts.	Volume III: Fauna & Flora Specialist Basic Assessment
	Ecological drivers of the ecosystem	Transformation of intact habitat on a cumulative basis would contribute to the fragmentation of the landscape and would potentially disrupt the connectivity of the landscape for fauna and flora and impair their ability to respond to environmental fluctuations. Due to the presence of a number of other renewable energy developments in the area, this is a potential cumulative impact of the development that is assessed.	Volume III: Fauna & Flora Specialist Basic Assessment

"securing ecological sustainable development and use of natural resources"[15]			
Question		**Answer**	**Reference**
	Environmental Management Framework	No area-specific Environmental Management Framework exists for the site. The proposed Paulputs WEF complies with all policies and planning tools.	Volume III: Social Impact Assessment
	Spatial Development Framework	The PSDF of 2012 highlights that renewable energy sources such as solar, thermal and wind, comprise 25% of the Northern Cape's energy generation capacity by the year 2020, and should be progressively phased in, as appropriate into the province. The PSDF further sets out energy objectives, which include the following: • To promote the development of renewable energy supply schemes; • To enhance the efficiency of Eskom's power station at the Vanderkloof power station; • Reinforce additional electricity supply especially renewable energy projects; and • Develop and implement innovative energy technologies to improve access to reliable, sustainable and affordable energy services. Also recognize that the objective should be to obtain sustainable economic growth. Lastly, the PSDF notes that the Northern Cape need to develop large-scale renewable energy supply schemes in order to address the growing demand in energy and to promote a green economy in the province.	Volume III: Social Impact Assessment page 19-21
	Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.)	All global responsibilities to which South Africa is signatory or party to were assessed within this report. Applicable international treaties and conventions are: • UNFCCC Paris Agreement (2016) • The Convention on Biological Diversity (CBD) (1993) • The Convention on the Conservation of Migratory Species of Wild Animals (CMS or Bonn Convention) (1983) • The Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) (1999) The proposed development complies with all international responsibilities.	Volume III: Social Impact Assessment; Bird Impact Assessment; Bat Impact Assessment
How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy		The proposed development can disturb listed plant species and vegetation from clearing of the development footprint, soil erosion and alien plant invasion. Increased levels of pollution, noise, disturbance and human presence can impact negatively on faunal communities. Biodiversity value and ecological functioning of the proposed development area are potentially affected by the development. As part of the EIA process specialist studies were conducted to identify areas most environmentally suitable for development within the proposed development site boundary.	Volume I App B: EMPr Volume III: Specialist reports

"securing ecological sustainable development and use of natural resources"[15]		
Question	**Answer**	**Reference**
(including offsetting) the impacts? What measures were explored to enhance positive impacts?	As a result of these studies a development layout has been produced that avoids sensitive areas and identified constraints. The specialists have proposed mitigation measures to further reduce residual risks or enhance opportunities during construction, operation and decommissioning phases of the development. With implementation of these mitigation measures, all identified negative impacts are expected to be reduced to acceptable levels of medium or low negative significance. All mitigation measures proposed by the specialists are included in the EMPr for the project.	
How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	On a national level the development will lessen the country's dependency on coal, and contribute to lowering water consumption, pollution and environmental degradation per kW of electricity produced. The EMPr provides measures for avoidance and minimisation of pollution, as well as enhancing any potential positive impacts.	Volume I App B: EMPr
What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	The generation of waste will largely be restricted to the construction phase of the project and consist of normal construction phase solid waste streams. The EMPr will detail specific mitigation measures that must be implemented for the appropriate management and minimisation of waste, during all phases of the project. Registered service providers will be utilised to transport solid waste to registered landfills.	Volume I App B: EMPr
How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	Visual buffers are applied to cultural landscapes / heritage sites. The development layout is produced by avoiding turbine placement within these visual buffers. A Heritage Impact Assessment and a Visual Impact Assessment were conducted to assess the proposed layout. Final comment from SAHRA was received during the public review period. SAHRA has no objections to the proposed development proceeding. The comment included recommendation to be included on the Final EIA report and EMPr. Mitigation measures have been identified by the heritage specialists to minimise and remedy residual impacts, and enhance positive impacts, including: • Cluster renewable energy facilities and related infrastructure; • Maximise the distance between the turbines and the N14; • Ensure effective rehabilitation of areas not required during operation (e.g. temporary laydown areas);	Volume III: Heritage Impact Assessment & Visual Impact Assessment. Volume II – Public Participation

<table>
<tr><th colspan="4">"securing ecological sustainable development and use of natural resources"[15]</th></tr>
<tr><th colspan="2">Question</th><th>Answer</th><th>Reference</th></tr>
<tr><td colspan="2"></td><td>• Minimise lighting;
• Implement other best practice visual mitigation measures suggested by the visual specialist; and
• Protect and report any graves, dense concentrations of artefacts or fossil bones found during vegetation clearing or excavation of foundations.</td><td></td></tr>
<tr><td colspan="2">How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?</td><td>Wind is a renewable resource and will be the 'fuel' for the WEF to generate electricity. Therefore the development will have a minimal impact on non-renewable resources.</td><td>n/a</td></tr>
<tr><td rowspan="2">How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and</td><td></td><td>The WEF will use the renewable energy resource of wind to generate power.
Construction of the WEF will require use of water, a renewable natural resource.
Operation of the WEF will consume relatively small quantities of water when compared to alternative energy technologies such as coal.
Impacts on the ecosystem caused by use of these renewable energy resources has been evaluated.</td><td>n/a</td></tr>
<tr><td>Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? (note: sustainability requires that settlements reduce their ecological footprint by using less material and energy demands and reduce the</td><td>The proposed WEF will reduce South Africa's dependency on non-renewable resources, particularly coal, as an energy source.
Wind as an energy source is not dependant on water, as compared to the massive water requirements of conventional power stations, has a limited footprint and does not impact on large tracts of land, and poses limited pollution and health risks, specifically when compared to coal and nuclear energy plants.</td><td>n/a</td></tr>
</table>

"securing ecological sustainable development and use of natural resources"[15]			
Question		**Answer**	**Reference**
thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts?	*amount of waste they generate, without compromising their quest to improve their quality of life)*		
	Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources this the proposed development alternative?)	The current land use is low-intensity grazing and the land is not suitable for other agricultural uses. The proposed development will increase yield as the landowners will be paid for the use of their land. This will improve cash flow and financial sustainability of farming enterprises on site. The proposed development itself will not cause a significant change in land use, as the development site is primarily low intensity agriculture (grazing), which can still proceed once the development is constructed. Wind is a renewable resource and a wind energy facility is the best use thereof. The WEF site would also be suitable for a solar facility, however the current land use would not be able to continue.	Volume III: Agricultural Impact Assessment; Social Impact Assessment
	Do the proposed location, type and scale of development promote a reduced dependency on resources?	The proposed WEF is predicted to reduce dependency on coal as an energy source. Wind as an energy source is not dependant on water, as compared to the massive water requirements of conventional coal fired power stations, has a limited footprint and does not impact on large tracts of land, and poses limited pollution and health risks, specifically when compared to coal and nuclear energy plants.	n/a
How were a risk-averse and cautious approach applied in terms of ecological impacts?	*What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?*	The current study consists of a detailed field assessment conducted across several site visits as well as a desktop study, which serves to significantly reduce the limitations and assumptions required for the study. In addition, the adjacent farms around the Paulputs Substation have been previously assessed by the consultant for several different projects, with the result that area is well known and has been sampled at different times of the year over a period of several years. For the current assessment, sampling took place in the wet season, but conditions were still relatively dry during each of the site visits and the majority of vegetation across the site was relatively dry and in a dormant state. As a result, some plant species were not visible at the time and only the lists of the perennial species are considered reliable. While this poses some limitations for the study, the different habitats present could still be easily discerned based on the vegetation present and this is not likely to significantly affect the sensitivity mapping of the site or the characterisation of the plant communities present. As, while there are a variety of annuals and geophytes present in the area, these are almost all common and widespread species and the species of concern that	Volume III: Fauna & Flora Specialist Basic Assessment

"securing ecological sustainable development and use of natural resources"[15]			
Question		**Answer**	**Reference**
		may be present are either larger perennials or smaller succulents that are less vulnerable to seasonal and inter-annual variations in moisture availability. Thus, the dry conditions over the study period is seen to pose some limit the number of annuals and geophytes that were encountered in the field survey, but the consequence of this is not seen as being of high significance for the study and is not considered to impose a serious limitation on the study. Many fauna are difficult to observe in the field and their potential presence at a site must be evaluated based on the literature and available databases. However, many remote areas have not been well-sampled with the result that the species lists derived for such areas do not always adequately reflect the actual fauna present. In order to reduce this limitation, and ensure a conservative approach, the species lists derived for the site from the literature were obtained from an area significantly larger than the study site and are likely to include a much wider array of species than actually occur at the site. In addition, the camera trapping that was conducted at the site provides a reliable baseline of larger vertebrates present at the site and provides an actual indication of the fauna present and their levels of activity and distribution across the site. This is considered to be a cautious and conservative approach to the assessment and is considered significantly more reliable and robust than relying on available information alone, especially for such a poorly known area.	
	What is the level of risk associated with the limits of current knowledge?	The risk associated with assumptions and limits of current knowledge is the potential for information being assessed to be incorrect. This would translate to erroneous impact identification and mitigation measures. However, due to the amount of site work conducted the risk associated with this is considered to be low.	Volume III: Fauna & Flora Specialist Basic Assessment
	Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	In order to counter the likelihood that the area has not been well sampled in the past and in order to ensure a conservative approach, the species lists derived for the site from the literature were obtained from an area significantly larger than the study area and are likely to include a much wider array of species than actually occur at the site. This is a cautious and conservative approach which takes the study limitations into account. Adopting a risk-averse and cautious approach in all stages of the impact assessment allows one to minimise the chance of assessing incorrect information and identifying erroneous impacts. This precautionary approach was utilised throughout the process by all specialists. The precautionary approach has been adopted for this study, i.e. assuming the worst-case scenario will occur and then identifying ways to mitigate or manage these impacts. Current gaps in knowledge include confirmation on the preferred turbine generating capacity and turbine technology to be used at this site. Ways in which these gaps are addressed are to consider the worst-case scenarios as noted above in terms of turbine size and generation capacity. Mitigation measures to manage these impacts have been identified.	Volume III: Fauna & Flora Specialist Basic Assessment

<table>
<tr><th colspan="4">"securing ecological sustainable development and use of natural resources"[15]</th></tr>
<tr><th colspan="2">Question</th><th>Answer</th><th>Reference</th></tr>
<tr><td rowspan="2">How will the ecological impacts resulting from this development impact on people's environmental right in terms following:</td><td>Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?</td><td>Impacts on people's rights have been identified and assessed by the social specialist, visual specialist and noise specialist.
The visual specialist identified no go areas and areas most visually suitable for development. The proposed development layout was produced by avoiding turbine placement within these visual buffers, including a 500 m constraint surrounding the National Road N14.
The visual specialist report found the site to be of low to moderate visual sensitivity. The landscape is more natural than cultural but will experience visual impacts. The important part of this is that the N14 is considered a route of cultural significance and aesthetic value because of the qualities of the landscape through which it passes.
The significance of the potential negative health risks posed by the development (noise, shadow flicker, electromagnetic radiation) is expected to be low.
The noise impact assessment found the level of noise impacts for the Paulputs WEF are expected to be of low significance with mitigation.
The operational impact on the sense of place is expected to be of medium negative significance with or without mitigation.</td><td>Volume III:
Visual Impact Assessment;
Social Impact Assessment;
Noise Impact Assessment</td></tr>
<tr><td>Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?</td><td>Renewable energy has fewer negative health effects than other forms of non-renewable energy generation and will have overall positive health benefits.</td><td>Volume III:
Social Impact Assessment</td></tr>
<tr><td colspan="2">Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?</td><td>The findings of this Social Impact Assessment (SIA) conducted for the proposed Paulputs WEF indicates that during the construction and the operational phase of the proposed development project, various employment opportunities, with different levels of skills will be created. In addition this will also create local business opportunities benefitting the socio-economic development of the local communities of Pofadder and Kakamas. The local communities will benefit from the establishment of a Community Trust if it is managed effectively. The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the negative environmental and socio-economic impacts associated with a coal based energy economy and the challenges created by climate change, represents a significant positive social benefit for society as a whole.</td><td>Volume III:
Social Impact Assessment</td></tr>
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"securing ecological sustainable development and use of natural resources"[15]		
Question	**Answer**	**Reference**
Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives/targets/considerations of the area?	The ecology, avifauna, bat and aquatic specialists have all concluded that the development does not have unacceptable negative impacts that cannot be mitigated to a low or medium level of significance.	Volume III: Fauna & Flora Specialist Basic Assessment
Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?	Iterative specialists' constraints mapping identified the most suitable areas for development for which a development layout was then produced for assessment. The results of the specialist's studies further informed the development of the updated site layout.	Volume III: Specialist Reports
Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	The area of land taken out of agricultural grazing as a result of all cumulatively assessed projects will amount to a total of approximately 2,500 hectares. As a proportion of the area within a 35 km radius (approximately 385,000 ha), this amounts to only 0.65 % of the surface area. That is well within an acceptable limit in terms of loss of very low potential agricultural land, of which there is no scarcity. The impact of the current development on the more sensitive features of the area, in particular the dune systems, quartz areas and rocky hills can be minimised. Sensitive areas identified by the various specialists have been avoided.	Volume III: Specialist Reports

Table 5.2: Socio-economic Considerations of Need and Desirability

"promoting justifiable economic and social development"[16]			
Question		**Answer**	**Reference**
What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?:	*The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area,*	**Namakwa District Municipality Integrated Development Plan (IDP) for 2018-2019** In the 2018-2019 revised IDP of the NDM their objectives are set: to stimulate radical economic and social transformation; to foster partnerships with relevant role-players; to support and capacitate local municipalities in the district; to be transparent and accountable; and lastly to provide local leadership. The IDP states that the NDM is aware of the challenges regarding unemployment, inequality and poverty, and to grow economically structural changes are required. The IDP further provides the NDMs'	Volume III: Social Impact Assessment

[16]Section 24 of The Constitution of South Africa refers.

"promoting justifiable economic and social development"[16]			
Question		**Answer**	**Reference**
		strategic objectives which includes amongst others to promote and facilitate local economic development, and to enhance good governance through the implementation of a climate change response plan. In conclusion the IDP must be seen by local municipalities as a tool for sustainable integrated development planning and development in the NDM (NDM, 2018). **Khâi-Ma Local Municipality Integrated Development Plan for 2012-2017** The vision of the Khâi-Ma Local Municipality as reflected in the municipalities' IDP of 2012 to 2017 is to ensure a sustainable economic future for all. The mission of the municipality is further to ensure affordable service delivery and a sustainable economic growth. The IDP recognizes its development role to facilitate interventions that would create new business enterprises in its mission. The five (5) key performance areas that the Khâi-Ma Local Municipality IDP of 2012-2017 focused on are: Institutional capacity and municipal transformation; basic services and the development of infrastructure; financial viability; economic development; and public participation and good governance. This plan further refers to sector planning in terms of the municipalities' spatial development path, economic growth path, and the provision of basic services (KLM, 2012) **ZF Mgcawu District Municipality Draft Integrated Development Plan of 2018/2019 for 2017 – 2022** It is the mission of the ZF Mgcawu District Municipality Draft Integrated Development Plan for 2017–2022 (further referred to as the plan) to be a centre of excellence in providing quality basic services to support local municipalities in the district. The core values according to the plan are outlined below: • The commitment to the development of people; • The integrity in the performance of the municipality's duty; • Respecting their natural resources; • The transparency in accounting for their actions; • Consultation on a regular basis to ensure the quality of service delivery; • Ensuring professionalism in the work environment; and • The efficient spending and responsible utilisation of the assets of the municipality (ZDM, 2018:9). According to the plan the strategic objectives of the District are as follows (ZDM, 2018:10–11): • To monitor and determine the housing backlogs in the district as well as to inform the public on housing information;	

"promoting justifiable economic and social development"[16]			
Question		**Answer**	**Reference**
		• To assess and provide targeted support improving institutional capacity and service delivery capabilities of category B-municipalities; • To promote environmental health and safety of communities in the ZF Mgcawu District through the proactive prevention, mitigation, identification and management of environmental health services, fire and disaster risks; • To promote safety of communities in the ZF Mgcawu District through the proactive prevention, mitigation, identification and management of fire and disaster risks; • To facilitate the development of sustainable regional land use, economic, spatial and environmental planning frameworks that will support and guide the development of a diversified, resilient and sustainable district economy; • To market, develop and co-ordinate tourism in the ZF Mgcawu District by promoting a green Kalahari tourism brand; • To assess and monitor the status of infrastructure needs and requirements of Category B-municipalities; and • To ensure efficient business operations and to fulfill the assurance statutory requirements of the ZF Mgcawu District Municipality. The strategic objectives above guided the priority issues identified for each area given in the Plan. It is however noteworthy that the same strategic objectives are reflected in the previous IDP. The issues that were highlighted that relates to the proposed project is firstly the development of infrastructure, and secondly the possibility of renewable energy for the development of new buildings **Kai !Garib Municipality Draft Integrated Development Plan of 2018/2019** The Kai !Garib Municipality Draft Integrated Development Plan of 2018/2019 (KGLM, 2018:17) vision is to "*create an economically viable and fully developed municipality, which enhances the standard of living of all the inhabitants/ community of Kai !Garib through good governance, excellent service delivery and sustainable development".* The recent IDP (KGLM, 2018:30) stated that new opportunities opened up for the KGLM since the need to facilitate the generation of sustainable energy was introduced in South Africa. It further elaborates that the KGLM became a "hotspot" for renewable energy facilities like solar energy development and hydro. According to the KGLM (2018:31) the business sector of the KGLM shows great growth potential because the area is becoming known for the availability of land for industrial and business development. Requests to buy land for renewable energy facilities have increased and the KGLM perceives this as an area for potential expansion in the business sector of the KGLM. The IDP provides a swot analysis for the KGLM. Two of the strengths are considered renewable energy facilities, i.e. solar and hydro. There are currently six established Independent Power Producers (IPPs) in the KGLM (KGLM, 2018:56), however there are potential for further IPPs to become	

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<tr><th colspan="2">Question</th><th>Answer</th><th>Reference</th></tr>
<tr><td rowspan="4"></td><td></td><td>operational in the KGLM. It is evident from the KGLM draft IDP of 2018/2019 that the establishment of renewable energy facilities in the KGLM are not only supported, but also encouraged for the sustainable growth of this municipal area.</td><td></td></tr>
<tr><td>Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.),</td><td>The Northern Cape Provincial Development and Resource Management / Provincial Spatial Development Framework (PSDF) of 2012 highlights that renewable energy sources such as solar thermal and wind, comprise 25% of the Northern Cape’s energy generation capacity by the year 2020, and should be progressively phased in as appropriate into the province. The PSDF further sets out energy objectives, which include the following:
• To promote the development of renewable energy supply schemes;
• To enhance the efficiency of Eskom’s power station at the Vanderkloof power station;
• Reinforce additional electricity supply especially renewable energy projects; and
• Develop and implement innovative energy technologies to improve access to reliable, sustainable and affordable energy services. Also recognize that the objective should be to obtain sustainable economic growth.
Lastly, the PSDF notes that the Northern Cape need to develop large-scale renewable energy supply schemes in order to address the growing demand in energy and to promote a green economy in the province</td><td>Volume III: Social Impact Assessment</td></tr>
<tr><td>Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and</td><td>The current land use is low intensity grazing with no other land use planned or occurring.</td><td>Volume III: Social Impact Assessment; Heritage Impact Assessment</td></tr>
<tr><td>Municipal Economic Development Strategy (“LED Strategy”).</td><td>The Khâi-Ma Local Municipality set forth a local development plan in the IDP to strategize on how to create employment opportunities in the KLM, to alleviate poverty, and to redistribute resources and opportunities for the benefits of the people in the KLM.</td><td>Volume III: Social Impact Assessment;</td></tr>
<tr><td colspan="2">Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area?</td><td>Social impacts related to the construction phase:<table><tr><th>Potential +/- Impact</th><th><u>Significance rating without mitigation</u></th><th><u>Significance rating with mitigation</u></th></tr><tr><td>Potential Positive Impact: The creation of local employment, business opportunities,</td><td>Medium (+)</td><td>High (+)</td></tr></table></td><td>Volume III: Social Impact Assessment;</td></tr>
</table>

"promoting justifiable economic and social development"[16]		
Question	**Answer**	**Reference**

and opportunities for skills development and on-site training.		
Potential Positive Impact: The potential maximising of opportunities to local and regional SMMEs and other business for service delivery.	Medium (+)	High (+)
Potential Negative Impact: The potential loss of farmlands for grazing of sheep and on associated farming activities.	Low (-)	Low (-)
Potential Negative Impact: In-migration or potential influx of job seekers.	Low (-)	Low (-)
Potential Negative Impact: The presence of construction workers on-site and in the area on the local communities.	Medium (-)	Low (-)
Potential Negative Impact: Potential safety risk for farmers, risk of livestock theft and theft of farming infrastructure.	Medium (-)	Low (-)
Potential Negative Impact: The potential impacts of heavy vehicles and construction related activities, damage to roads, and dust pollution.	Medium (-)	Low (-)
Potential Negative Impact: The increased risk of potential veld fires associated with the construction phase.	Medium (-)	Low (-)

Social impacts related to the operational phase:

Potential +/- Impact	**Significance rating without mitigation**	**Significance rating with mitigation**
Potential Positive Impact: The creation of local employment and business opportunities, skills development and training.	Medium (+)	Medium (+)
Potential Positive Impact: Potential up- and downstream economic opportunities.	Medium (+)	Medium (+)

"promoting justifiable economic and social development"[16]		
Question	**Answer**	**Reference**

Potential Positive Impact: The establishment of renewable energy infrastructure and the generation of clean, renewable energy.	Medium (+)	High (+)
Potential Positive Impact: The generation of additional income for landowners.	Low (+)	Medium (+)
Potential Positive Impact: The benefits associated with the establishment of a Community Trust.	Medium (+)	High (+)
Potential Negative Impact: Visual impact and associated impact on the sense of place.	Low (-)	Low (-)
Potential Negative Impact: The potential impact on tourism.	Low (-)	Low (-)

Social impacts related to the decommissioning phase:

Potential +/- Impact	**Significance rating without mitigation**	**Significance rating with mitigation**
Potential Negative Impact: The potential loss of employment opportunities and associated income.	Medium (-)	Low (-)

Social impacts related to the no-development alternative:

Potential +/- Impact	**Significance rating without mitigation**	**Significance rating with mitigation**
Potential Impact: The potential lost opportunity for South Africa to supplement its current energy needs with clean, renewable energy and a lost opportunity for the Khâi-Ma Local Municipality and the Kai !Garib Local Municipality.	Medium (-)	Medium (+)

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Social impacts related to the grid connections:
<table>
<tr><th>Potential +/- Impact</th><th>Significance rating without mitigation</th><th>Significance rating with mitigation</th></tr>
<tr><td>Potential Negative Impact: The potential visual impact and impact on sense of place.</td><td>Medium (-)</td><td>Low (-)</td></tr>
</table>
Social impacts related to cumulative social impacts:
<table>
<tr><th>Potential +/- Impact</th><th>Significance rating without mitigation</th><th>Significance rating with mitigation</th></tr>
<tr><td>Potential Positive Impact: The creation of local employment and business opportunities, skills development and training.</td><td>Medium (+)</td><td>High (+)</td></tr>
<tr><td>Potential Negative Impact: Visual impact associated with the establishment of WEFs and impact on sense of place and character of area.</td><td>Medium (-)</td><td>Medium (-)</td></tr>
<tr><td>Potential Negative Impact: The establishment of a number of renewable energy facilities (WEFs and SEFs), may potentially place pressure on local services, e.g. education, medical, accommodation etc.</td><td>Low (-)</td><td>Low (-)</td></tr>
</table>
</td><td></td></tr>
<tr><td></td><td>Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?</td><td>
The proposed development will contribute towards local economic development and skills development programs of the two local and two district municipalities through the support and co-operation between public and private sectors, creation of employment and business opportunities, and the opportunity for skills development and on-site training during both construction and operation phases.
The project proponent indicated in their basic information that they are committed to implement training and skills development programmes during the construction and operational phase of the proposed Paulputs WEF, hence promoting skills development and
</td><td>Volume III: Social Impact Assessment</td></tr>
</table>

“promoting justifiable economic and social development”[16]			
Question		**Answer**	**Reference**
		creating local employment opportunities in the area. Additionally, the project proponent showed their commitment to the establishment of a Community Trust. Community Trusts creates opportunities to support local socio-economic development initiatives for the duration of the project (20–25 years), for example: school feeding schemes, training and skills development programmes as mentioned above, and supporting basic services to mention just a few. An estimated 5 % target of the shares of the proposed project are to be reserved for the local community, however this value is dependent on the requirements provided by the DoE and is therefore subject to change	
How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?		The proposed development will contribute towards the local economic development strategies of the two local and two district municipalities through the creation of employment and business opportunities, and the opportunity for skills development and on-site training during both construction and operation phases. In addition the proposed development will also create local business opportunities benefitting the socio-economic development of the local communities of Pofadder and Kakamas. The local communities will benefit from the establishment of a Community Trust if it is managed effectively.	Volume III: Social Impact Assessment
Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? Will the impact be socially and economically sustainable in the short- and long-term?		Wind energy facilities are socially and economically sustainable in the short and long term. IPP projects require a minimum ownership of 2.5 % by local communities which represents a significant injection of capital into mainly rural areas of South Africa for the lifespan of the facility. In addition local content minimum thresholds result in a substantial stimulus for establishing local manufacturing capacity. A target requirement for BBBEE of 60 % of procurement spend has raised employment opportunities for black South African citizens and local communities. Social economic development contributions are concentrated in the immediate vicinity of the IPPs and as such there is a lack of equity across geographical areas with some communities benefitting more than others.	Volume III: Social Impact Assessment
In terms of location, describe how the placement of the proposed development will:	*result in the creation of residential and employment opportunities in close proximity to or integrated with each other,*	During the construction phase of the Paulputs WEF employment opportunities will be created, for low-skilled workers, semi-skilled and for skilled personnel. Members from the local communities are likely to be in a position to qualify for the majority of the low skilled and a proportion of the semi-skilled positions. The construction phase will employ approximately 300 - 400 employees. From the estimated employment opportunities approximately 15 % (±45 - 60) will be skilled, 30 % (±90 - 120) semi-skilled, and 55 % (±165 - 220) low-skilled. The typical lifespan of WEFs is 20 to 25 years. During the operational phase there will be a significant decrease in employment opportunities. The operational phase of the proposed	Volume III: Social Impact Assessment;

"promoting justifiable economic and social development"[16]			
Question		**Answer**	**Reference**
		project will provide approximately 30 to 50 employment opportunities of which 20 % (±6 - 10) will be skilled, 40 % (±12 - 20) semi-skilled and 40 % (±12 - 20) low-skilled. Typical employees that might be required include: Technicians, electricians, engineers, IT specialists, environmental specialists, health and safety managers, and administrators (skilled); drivers and equipment operators (semi-skilled); construction workers and security staff (low-skilled). It should be noted that the majority of the semi- and low-skilled employment opportunities are likely to be available to the local communities of Pofadder and Kakamas, which will present a positive social benefit to these communities due to the low availability of employment opportunities in these areas. The recruitment process and the requirements for each skill level and each employment opportunity need to be clearly communicated to local communities to ensure that no unrealistic expectations are created. The total wage bill for the construction phase of approximately 400 employees over a period of 36 months is approximately R80 Million, where 30 % of the wage is for skilled, 40 % semi-skilled and 30 % to low-skilled employees. This represents a positive opportunity for the local economy of the towns of Pofadder and Kakamas as well as the project proponents' commitment to enhance opportunities and benefits for these local communities. The project proponent indicated in their basic information that they are committed to implement training and skills development programmes during the construction and operational phase of the proposed Paulputs WEF, hence promoting skills development and creating local employment opportunities in the area. Additionally, the project proponent showed their commitment to the establishment of a Community Trust. Community Trusts creates opportunities to support local socio-economic development initiatives for the duration of the project (20–25 years), for example: school feeding schemes, training and skills development programmes as mentioned above, and supporting basic services to mention just a few. An estimated 5 % target of the shares of the proposed project are to be reserved for the local community, however this value is dependent on the requirements provided by the DoE and is therefore subject to change.	
	reduce the need for transport of people and goods,	The need for transport of people and goods will be increased during the construction phase. Lower per capita carbon footprints are predicted due to the commercial forms of transport that will be employed to move the workforce (e.g. public transport, contractor buses).	Volume III: Traffic Impact Assessment;

"promoting justifiable economic and social development"[16]			
Question		**Answer**	**Reference**
	result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport),	Not applicable.	n/a
	compliment other uses in the area,	Local communities and their service providers will benefit from the socio-economic development provided by the WEF and current land use will be able to continue.	Volume III Social Impact Assessment;
	be in line with the planning for the area,	The proposed WEF is in line with applicable international, national, provincial and local planning strategies.	Volume III Social Impact Assessment
	for urban related development, make use of underutilised land available with the urban edge,	The proposed development occurs away from the urban edge.	n/a
	optimise the use of existing resources and infrastructure,	Wind energy is a renewable, clean resource and reduces pollution and the reliance on non-renewable fossil fuels and water for electricity generation. Existing access roads will be utilised wherever possible. The existing Eskom substation has the capacity to support this development. It is expected that any construction water required will be delivered by tankers. Waste removal will be in accordance with best practice 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. Any additional infrastructure required will be constructed by the developer.	n/a
	opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk	No opportunity costs in terms of bulk infrastructure expansions in non-priority areas are predicted due to the proposed development. The proposed WEF is not located within a bulk infrastructure expansion area.	n/a

"promoting justifiable economic and social development"[16]			
Question		**Answer**	**Reference**
	infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement),		
	discourage "urban sprawl" and contribute to compaction/densification,	Not applicable as the proposed development site lies outside of urban areas.	n/a
	contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs,	The existing Eskom substation has capacity for additional energy generation. The proposed development will utilise this existing capacity. The project will contribute to economic and infrastructure development in the Northern Cape Province, in line with the Northern Cape Provincial Development and Resource Management Plan.	n/a
	encourage environmentally sustainable land development practices and processes,	Construction of the renewable energy Paulputs WEF project will assist South Africa in transitioning from a carbon-intensive resource use economy to a sustainable low carbon footprint economy. Sustainable land development is an overarching aspect of the proposed project development.	n/a
	take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.),	Feasibility of access for wind turbine delivery, the site is easily accessible from the national road; Close proximity to the Eskom grid with available evacuation capacity; Viable wind resource, therefore suited to wind farm development; The proposed site is agricultural land and current land use is low intensity gazing; and Willingness of landowners to host a wind farm on their properties.	Section 6.2: Site Alternatives
	the investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential),	The proposed development will create jobs and contribute towards socio-economic development in an area that does not have high economic potential. The WEF is likely to result in significant positive socio-economic opportunities.	Vol III: Social Impact Assessment
	impact on the sense of history, sense of place and heritage of	Impacts to the cultural landscape are unavoidable but only of a medium significance and no other aspects of heritage are expected to be impacted significantly.	Vol III: Social Impact

"promoting justifiable economic and social development"[16]			
Question		**Answer**	**Reference**
	the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and		Assessment; Visual Impact Assessment; Heritage Impact Assessment
	in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	The proposed development aligns with the ZF Mgcawu District Municipality Draft Integrated Development Plan of 2018 / 2019 for 2017 - 2022. The proposed development is predicted to support the creation of a more integrated settlement.	Vol III: Social Impact Assessment
How were a risk-averse and cautious approach applied in terms of socio-economic impacts?:	*What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?*	In preparation of the final SIA report, one limitation that could be identified is that the demographic data was based on the most recent available Census data from the year 2011. This data can be considered dated and should be treated with caution. It was however useful in compiling a demographic profile of the affected area of the proposed development. Where necessary the data was however updated with the data from the Community Survey in 2016. A second identified limitation is that the site visit was conducting over the festive season therefore not all potential stakeholders were available for consultations. Follow-up consultations were scheduled telephonically, however stakeholders identified their unavailability to interviews and/or were unwilling to provide their input. For this reason the specialist extended the review of reports similar to the Paulputs WEF, and with the specialists experience with similar projects, this limitation does not affect the findings of this SIA report.	Vol III: Social Impact Assessment
	What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?	The risk due to limits of current knowledge is considered to be low due to the positive socioeconomic impact expected from the proposed WEF.	Vol III: Social Impact Assessment
	Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious	A risk-averse and cautious approach was utilised throughout the impact assessment process by all specialists.	Vol II: Social Impact Assessment

"promoting justifiable economic and social development"[16]			
Question		**Answer**	**Reference**
	approach applied to the development?	The precautionary approach has been adopted for this study, i.e. assuming the worst-case scenario will occur and then identifying ways to mitigate or manage these impacts. Mitigation measures to manage these impacts have been provided.	
How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following:	*Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?*	Negative impacts were identified by the Social Specialist. These are: • The potential loss of farmlands for grazing of sheep and on associated farming activities. • In-migration or potential influx of job seekers. • The presence of construction workers on-site and in the area on the local communities. • Potential safety risk for farmers, risk of livestock theft and theft of farming infrastructure. • The potential impacts of heavy vehicles and construction related activities, damage to roads, and dust pollution. • The increased risk of potential veld fires associated with the construction phase. • Visual impact and associated impact on the sense of place. • The potential impact on tourism. • The potential loss of employment opportunities and associated income (decommissioning impact). • The establishment of a number of renewable energy facilities (WEFs and SEFs), may potentially place pressure on local services, e.g. education, medical, accommodation etc. (cumulative impact). Measures to avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts are provided in the Social Impact Assessment and EIAr Section 10 for each impact above, and mitigation measures are included in the EMPr.	Vol III: Social Impact Assessment App B: EMPr EIAr Section 10
	Positive impacts. What measures were taken to enhance positive impacts?	Positive impacts were identified by the Social Specialist. These are: • The creation of local employment and business opportunities, and opportunities for skills development and on-site training; • The potential maximising of opportunities to local and regional SMMEs and other business for service delivery; • Potential up- and downstream economic opportunities; • Establishment of renewable energy infrastructure and the generation of clean, renewable energy;	Vol III: Social Impact Assessment EIAr Section 10

"promoting justifiable economic and social development"[16]			
Question		**Answer**	**Reference**
		• Generation of income for landowners; and • Benefits associated with the establishment of a Community Trust. Details of enhancement measures are provided in the Social Impact Assessment and EIAr Section 10 per impact.	
Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socio-economic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?		It is not expected that the development's socio-economic impacts will result in significant ecological impacts. Although the development would result in some habitat loss across the site, this is not likely to affect the local population of *Aloidendron dichotomum*. A more direct threat would likely be poaching and harvesting of young trees by construction or operational phase personnel on the site. Specific mitigation should be implemented during construction and operation to reduce this risk, including setting up and implementing a long-term population monitoring programme within the site for this species. Overall, provided that impact on *Aloidendron dichotomum* can be avoided, then development within the CBA area is considered acceptable from an ecological standpoint. However, as this area still contributes to meeting targets, represents habitat for *Aloidendron dichotomum* and is currently in a moderate condition, the overall extent of the development footprint in this area should be limited to ensure that its ecological function is not compromised. The final development footprint within the CBA is estimated at 15ha which is within the recommended 20ha footprint limit provided to the developer for this area and as such is considered acceptable.	Vol III: Social Impact Assessment; Fauna & Flora Specialist Basic Assessment
What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?		Iterative specialists' constraints mapping identified the most suitable areas for development for which a development layout was then produced for assessment. The results of the specialist's studies, including interviews by the Social Specialist, and Scoping phase PPP, further informed the development of the updated site layout.	Volume III Social Impact Assessment; Visual Impact Assessment
What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged	*Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?*	The proposed development aligns with a variety of planning policies that consider environmental and spatial justice.	Volume III: Social Impact Assessment

"promoting justifiable economic and social development"[16]			
Question		**Answer**	**Reference**
persons (who are the beneficiaries and is the development located appropriately)?			
What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?		The proposed development will contribute to equitable access by supplying electricity to the national grid, and by providing local and regional socioeconomic benefits in terms of the REIPPPP Economic Development requirements, which includes a BBBEE scorecard on which wind projects are evaluated.	n/a
What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?		Construction, operation and decommissioning of the proposed development will be done according to environmental health and safety legislative requirements and applicable guidelines.	n/a
What measures were taken to:	*ensure the participation of all interested and affected parties,*	Public participation is being undertaken according to NEMA: EIA Regulations (2014) as amended and DEA (2017) Public Participation Guidelines.	Section 4.1
	provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation,	The PPP is being undertaken in terms of legislative requirements and best practise guidelines. All notifications are provided in English and Afrikaans (where applicable). Further languages are made available upon request.	Section 4; Volume II
	ensure participation by vulnerable and disadvantaged persons,	The PPP is being undertaken according to best practise guidelines; Notification of initiation of the PPP was provided in all required channels, i.e. newspaper adverts, site notices, local posters and written notifications.	Section 4; Volume II
	promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means,	The proposed development fits into the various planning policies and the implementation of a Community Trust will assist the local strategies, including improving education facilities and youth development.	Vol III: Social Impact Assessment

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Question		**Answer**	**Reference**
	ensure openness and transparency, and access to information in terms of the process,	Legislative requirements and best practise guidelines are followed throughout the process. The PPP is being undertaken in terms of legislative requirements and best practise guidelines.	Section 4
	ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge, and	A PPP is being undertaken in terms of legislative requirements and best practise guidelines. A Social Impact Assessment forms part of the Scoping & EIA process. The independent Social Specialist ensures that all needs and values are taken into account.	Section 4; Volume III: Social Impact Assessment
	ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein were be promoted?	The Social Impact Assessment and PPP that are conducted according to legislation and guidelines ensure that women and youth are recognised and involved in the process. REIPPPP requirements place specific responsibilities on IPPs in terms of women and youth development.	Volume III: Social Impact Assessment
Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?		The proposed WEF has a good planning fit with all applicable policies and will result in substantial local socio-economic opportunities. The key challenges facing the region are poverty and inequality and a shortage of skills. As such the proposed development will be of benefit to the local area by creating job and business opportunities, particularly for unskilled and semi-skilled local workers.	Volume III: Social Impact Assessment
What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?		Future workers on the proposed development will be educated on their rights to refuse work.	n/a

"promoting justifiable economic and social development"[16]			
Question		**Answer**	**Reference**
Describe how the development will impact on job creation in terms of, amongst other aspects:	*the number of temporary versus permanent jobs that will be created,*	An estimated 300 - 400 temporary employment opportunities will be created for 24 - 36 months (2 - 3 years) during the construction phase. Approximately 30 - 50 full time employment opportunities will be created for the operational phase of the proposed development (minimum of 20 years).	Volume III: Social Impact Assessment
	whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area),	The majority of the semi- and low-skilled employment opportunities are likely to be available to the local communities of Pofadder and Kakamas, which will present a positive social benefit to these communities due to the low availability of employment opportunities in these areas.	Volume III: Social Impact Assessment
	the distance from where labourers will have to travel,	It is expected that most workers will reside in the nearby towns Pofadder and Kakamas.	Volume III: Social Impact Assessment
	the location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits), and	The majority of employment opportunities associated with the operational phase is likely to benefit HD members of the community. It will also be possible to increase the number of local employment opportunities through the implementation of a skills development and training programme linked to the operational phase. A percentage of permanent employees who are not locally based may purchase houses in one of the local towns in the area, such as Pofadder or Kakamas, others may decide to rent. Both options would represent a positive economic benefit for the region. In addition, a percentage of the monthly wage bill earned by permanent staff would be spent in the regional and local economy. This will benefit local businesses in the relevant towns. The benefits to the local economy will extend over the anticipated 20 year operational lifespan of the project. The local hospitality industry is also likely to benefit from the operational phase. These benefits are associated with site visits by company staff members and other professionals (engineers, technicians etc.) who are involved in the company and the project but who are not linked to the day-to-day operations. Procurement during the operational phase will also create opportunities for the local economy and businesses.	Volume III: Social Impact Assessment
	the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but	The creation of an estimated 300 - 400 temporary (24 - 36 month) jobs and 30 - 50 permanent jobs associated with the proposed development represents a high opportunity cost, as the employment by current agriculture operations is very low, and could continue.	Volume III: Social Impact Assessment

"promoting justifiable economic and social development"[16]			
Question		**Answer**	**Reference**
	impact on 1000 agricultural jobs, etc.).		
What measures were taken to ensure:	*that there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment, and*	All applicable planning policies and legislation were considered. The proposed development fits with all planning policies. Organs of State were pre-identified and registered on the I&AP database.	Volume III: Social Impact Assessment
	that actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?	As registered I&APs all public correspondence including notifications of reports availability are provided.	Volume II
What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?		The proposed development aims to uphold the principles of sustainable development. The project team consists of suitably qualified individuals that comply with all legal requirements.	Section 1; Volume III: Specialist reports
Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?		Specialist mitigation measures were identified during the EIA process and provided in the EIAr.	n/a
What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?		An EMPr is submitted with EIAr. The EMPr is a legally binding document, which when enforced during construction, operational or decommissioning phases, hold the applicant or their representative liable for any remedial actions as a result of negligence.	n/a
Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?		The alternative selection process includes the assessment of the No Development alternative, site alternatives, design layout alternatives and technology alternatives.	Section 6

<table>
<tr><th colspan="3">“promoting justifiable economic and social development”[16]</th></tr>
<tr><th>Question</th><th>Answer</th><th>Reference</th></tr>
<tr><td>Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?</td><td>Cumulative social impacts:
<table>
<tr><th>Potential +/- Impact</th><th><u>Significance rating without mitigation</u></th><th><u>Significance ratin with mitigation</u></th></tr>
<tr><td>Potential Positive Impact: The creation of local employment and business opportunities, skills development and training.</td><td>Medium (+)</td><td>High (+)</td></tr>
<tr><td>Potential Negative Impact: Visual impact associated with the establishment of WEFs and impact on sense of place and character of area.</td><td>Medium (-)</td><td>Medium (-)</td></tr>
<tr><td>Potential Negative Impact: Establishment of a number of renewable energy facilities (WEFs and SEFs), may potentially place pressure on local services, e.g. education, medical, accommodation etc.</td><td>Low (-)</td><td>Low (-)</td></tr>
</table></td><td>Volume III: Visual Impact Assessment; Social Impact Assessment</td></tr>
</table>

5.2 Need and Desirability Conclusion

The need for the proposed development is supported in terms of meeting the country's climate change goals, and in terms of reducing the country's dependence on fossil fuels as the main source of meeting the country's electricity requirements. National, provincial and local policies and planning documents support the development of renewable energy facilities, and the associated socioeconomic boost at the local level in an area that is in need of it.

The proposed Paulputs WEF and Grid Connection will create direct jobs largely during the construction period. Indirect jobs in accommodation, catering and other services that would support a wind farm as well as training, business and skill development opportunities will be realised. REIPPPP local economic development requirements are expected to enhance these positive benefits. Several other renewable energy facilities located nearby will result in further enhancement of the positive socioeconomic benefits.

The proposed development site is currently used for low intensity grazing and has little potential for other types of land use. Grazing could continue on the site during the construction and operation of the development. Cumulatively the proportion of land potentially occupied by renewable energy facilities within a 35 km radius of the site is approximately 0.65 %. In an area of low agricultural or other land use potential, and considering the need to meet South Africa's renewable energy generation targets, the proposed development is desirable at this time and place.

As discussed in detail above, as well as in Section 6 Assessment of Alternatives below, the proposed development represents the best practicable environmental option, identified through specialists' assessments.

The study has concluded that there are no negative high residual impacts, including potential cumulative impacts associated with the proposed development.

A requirement of the REIPPPP is that in the development of any WEF, the local economy must benefit through employment opportunities, skills development, and the development or enhancement of community infrastructure. The cumulative effect of the proposed development and other developments in the area has the potential to result in highly significant positive socio-economic opportunities for the region.

6 ASSESSMENT OF ALTERNATIVES

6.1 The No Development Scenario or "No-Go Option"

To answer the question if the proposed development is desirable, an assessment of the No Development Scenario is made. This 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 this scenario include:

- The land-use remains agricultural, with no further benefits derived from the implementation of a complementary land use;
- There is no change to the current landscape or environmental baseline;
- No additional electricity will be generated on-site or supplied through means of renewable energy resources. This would have negative implications for the South African government in achieving its proposed renewable energy target, given the need for increased generation;
- There is no opportunity for additional employment (permanent or temporary) in the local area where job creation is identified as a key priority; and

- The national and local economic benefits associated with the proposed project's REIPPPP commitments and broader benefits would not be realised.

The purpose of the proposed development is to generate renewable electricity and export this to the national grid. Other socio-economic and environmental benefits that will result from the proposed development are:

- Reduced air pollution emissions - burning fossil fuels generates CO_2 emissions which contributes to global warming. Emissions of sulphurous and nitrous oxides are produced 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 a minimal amount of water during operation. As a water stressed country, South Africa needs to be conserving such resources wherever possible;
- Improved energy security – renewables can be deployed in a decentralised way close to consumers, improving grid strength while reducing expensive transmission and distribution losses. Renewable energy projects contribute to a diverse energy portfolio;
- Exploit significant natural renewable energy resources – biomass, solar and wind resources remain largely unexploited;
- Sustainable energy solutions – the uptake of renewable energy technology addresses the country's energy needs, generation of electricity to meet growing demands in a manner which is sustainable for future generations; and
- Employment creation and other local economic benefits associated with support for a new industry in the South African economy.

The 'No Development' alternative would not assist the government in addressing climate change, energy security and economic development. Implementing this option would also not allow for any beneficial socio-economic and environmental impacts as outlined above.

Addressing climate change is one of the benefits associated with the implementation of this proposed development. 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.

Based on the above, the 'No Development' alternative is not a preferred alternative.

6.2 Site Alternatives

To answer the question if the proposed development is desirable in the proposed location, an explanation on how the site was selected from a number of alternative locations is made in this section.

Initially sites are identified as a possibility, following which the Applicant models 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 is secured by means of a long-term lease. Once this has occurred the next step is for Pre-Feasibility, Monitoring and Full Feasibility.

The Pre-feasibility stage includes a range of preliminarily considerations which are investigated to evaluate the project sites, namely:

1. Willingness of land owners to lease land for the development of WEFs;
2. Grid connection options and capacity availability on the existing national grid;
3. The feasibility of site access;
4. Technical construction issues such as geological conditions and topography; and

5. 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 publicly available data or preliminary on-site investigations. Publicly available data is obtained from sources such as the Endangered Wildlife Trust (EWT), Birdlife SA, SANBI, local wildlife groups and other publicly 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, SANBI and Provincial/National Department of Environmental Affairs may be completed.

Only if no initial, high level issues are identified, 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 next stage is Full Feasibility, which includes the Basic Assessment or Scoping and EIA process. The aim of this phase is to address the project at a more detailed level 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 this stage is to inform the decision that the site can be financed and constructed. Since the developer 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.

The Applicant has and continues to develop a portfolio of sites across South Africa including sites in the Northern Cape. The proposed Paulputs WEF was selected out of the Applicant'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 Pre-feasibility and Monitoring stage.

In 2018 the Applicant appointed Arcus to conduct a feasibility assessment for the development of wind farms at four sites within the Northern Cape Province. The feasibility assessment was focussed on birds and bat, but also mentions other environmental sensitivities. Based on the feasibility assessment, two locations were preferred and the applicant appointed Arcus to commence with the long term monitoring of birds and bats on the site. During the monitoring, one site appeared to be more sensitive to birds and was no longer considered for wind farm development and was dropped by the applicant. Based on the above, and the potential low to medium impact on birds and bats, the applicant decided to proceed with the application for environmental authorisation at the Paulputs site, and undertake the necessary environmental assessment and specialists studies.

Further on-site wind monitoring is currently underway from anemometer masts and 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 tables below provide 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 WKN-Windcurrent portfolio of projects as this changes with time. It reflects the projects being considered at the time of selection of the proposed Paulputs WEF to be taken forward to the Full Feasibility stage, including the EIA process.

Based upon the analysis as summarised above and in the Tables below, the proposed Paulputs WEF site is the Preferred Site.

Table 6.1: Alternatives Table for the Proposed WEF - Investigated Regions

Factor	**Region A – Preferred Region**	**Region B**	**Region C**	**Region D**	**Region E**	**Region F**
Location Descriptor	Inland Northern Cape	Inland Eastern Cape	Inland Eastern Cape	Inland Eastern Cape	Inland Northern Cape	Inland Northern Cape
Wind Resource	Good based on wind measurement mast data at 120m	Below optimal based on installed wind measurement mast	Good based on desktop data and short wind mast data	Good based on desktop data and short wind mast data	Good based on desktop data and short wind mast data	Less than optimal average wind speed based on short wind mast data
Grid Connection	Available close to site	Available close to site	Available close to site	Limited connection capacity available on site	Available close to site	Available close to site
Land Use and Land Availability	Suitable land use and able to secure	Suitable land use and able to secure	Suitable land use and able to secure	Suitable land use and able to secure	Suitable land use and able to secure	Suitable land use and able to secure
Site Access	Good	Moderate - difficult	Good	Good	Good	Good
Environmental Sensitivity	Low sensitivity	Low - medium sensitivity	High sensitivity – avifaunal concerns (Rudd's Lark, Cape Vulture)	High sensitivity – avifaunal concerns (Cape Vulture)	Medium to High sensitivity – avifaunal concerns (Verreaux's Eagle, kestrels, Ludwig's Bustard, Blue Crane)	Medium Sensitivity – avifaunal concerns (Ludwig's Bustard, Verreaux's and Martial Eagle)
Status of Development / Decision	Advance into EIA Procedure	Not advanced	Not advanced	Not advanced	Not advanced	Not advanced

Table 6.2: Alternatives Table for the Proposed WEF - Specific Site Selection within Preferred Region

Factor	Suitability of the Preferred Site	Suitability of Area North of Preferred Site	Suitability of Area East of Preferred Site	Suitability of Area South of Preferred Site	Suitability of Area West of Preferred Site
Land Availability	The site is located on flat land that offers suitable buildable area for up to 85 turbines. The landowners have signed option agreements and consent forms for the undertaking of the EIA process.	Not pursued due to several factors: An area designated as CBA2 is located to the North and West of the site. The land to the north is more mountainous and has more drainage channels/streams, making it less suitable for wind farm development	The Land to the South-East is unavailable to the Applicant.	Not pursued because an IBA with red dune habitat suitable for Red Lark, etc. is located to the South West of the site.	Not pursued due to several factors: CSP and Solar PV farms already operational or under construction Lower wind resource according to modelled data Verreaux's Eagle Nest located to the west of site An area designated as CBA2 is located to the North and West of the site.
Land Use	Arid land currently used for very low density livestock farming.	N/A – Mountainous terrain unsuitable for development.	Private.	N/A – IBA with red dunes unsuitable for development.	CSP and Solar PV farms already operational or under construction
Environmental Sensitivity	Relatively low environmental sensitivity.	High sensitivity – mountainous terrain	Relatively low environmental sensitivity.	High sensitivity - An IBA with red dune habitat suitable for Red Lark, etc. is located to the South West of the site	High Sensitivity - An IBA with red dune habitat suitable for Red Lark, etc. is located to the South West of the site. In addition, An area designated as CBA2 is located to the North and West of the site.
Wind speed levels	Feasible wind speed confirmed through one year of onsite wind monitoring.	Less than that of preferred site based on modelled data	Feasible wind speed based on modelled data.	Less than that of preferred site based on modelled data	Less than that of preferred site based on modelled data
Distance to grid	Eskom powerlines and substation within close distance to the North-West.	Eskom powerlines and substation within close distance to the North-West.	Eskom powerlines and substation further away	Eskom powerlines and substation further away	Eskom powerlines and substation within close distance to the North-West.
Status of Development	Advanced to EIA Stage	Not advanced	Not advanced	Not advanced	Not advanced

6.3 Design Evolution Alternatives

Following the selection of a suitable site, consideration was given to the design of the WEF within that site. It is important that wind turbines are sited in the optimum position to maximise the wind energy yield whilst minimising environmental impacts as far as possible.

Information collated during the scoping phase was used to inform the design of the WEF progressively. Best practice advises that the EIA should be an iterative process rather than a post design environmental appraisal. In this way, the findings of the technical environmental studies have been used to inform the design of a development.

This approach has been adopted with respect to this proposed development, and where potentially significant impacts were identified, efforts were made to avoid these through evolving the design of the proposed development. This may be referred to as mitigation to be embedded in the layout and design, or 'embedded mitigation'.

A preliminary layout was produced showing suggested locations of wind farm turbines on the site, which was assessed and included as part of the scoping phase. This layout has been adjusted, based on the initial scoping assessment and specialists' findings. This adjusted layout was assessed in further detail during the EIA Phase, found to be acceptable by all specialists, and is thus the preferred Final Mitigated Layout for Authorisation.

Table H: Development Area Geographic Coordinates - Paulputs WEF Final Mitigated Layout Turbine Locations above indicates the location of the turbines post EIA assessment and indicates the final preferred locations to be considered for authorisation (Final Mitigated Layout - Figure 7.1 Proposed Site Development Plan and Figure 12.1 Environmental Sensitivity Map).

6.4 Technology Alternatives

The applicant of the proposed Paulputs WEF is a wind energy developer and does not have the capacity to develop and consider a different technology alternative. Regardless, the question if wind energy technology is the best technology for the proposed location must be answered as part of the Need & Desirability assessment (Section 5).

Alternative renewable energy technologies include hydro-electric power, photovoltaic solar or concentrated solar power. The site itself has no resource for hydro-electricity. Solar electricity generation would however be feasible in this location, as is evidenced by the neighbouring operational concentrated solar power (CSP) plants. Solar plants require a much greater infrastructure footprint and water consumption (for cleaning panels) to generate the equivalent energy of wind energy facilities. Wind farms are less land and water intensive than solar projects. Two large scale CSP trough facilities are in operation adjacent to the proposed Paulputs WEF and a 200 MW CSP tower plant has been approved in the vicinity (Figure 3.1). Further PV facilities are also planned for the area. Therefore the cumulative impact of another large-scale solar facility on the ecology of the area would be greater than the introduction of a different technology, with different impacts, much smaller footprint and lower water consumption in an arid area. Solar electricity generation would require a much greater infrastructure footprint to generate the equivalent energy of the proposed WEF.

Wind energy presents 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 affects vegetation 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 above, wind energy is considered a suitable technology for the proposed location.

Various wind turbine designs and layouts will be considered for the site in order to maximise the electricity generation capacity and efficiency, whilst taking into account environmental constraints. The turbine manufacturer and turbine model has not yet been determined and will not be decided upon until the completion of further wind analysis and competitive tendering.

6.5 Grid Connection Routing Options

Three overhead powerline route options are proposed from the onsite switching station Option A to the existing Eskom Paulputs Substation or the existing 132 kV overhead powerline. Overhead powerline Options A and B are approximately 19.6 km in length, while overhead powerline Option C is approximately 12.5 km.

At this stage it is known that Eskom in partnership with IPPs are considering construction of a collector substation adjacent to the existing Paulputs Substation on the farm portion belonging to the Koonkoosies II Project. This new collector substation is a possible future connection point for the proposed Paulputs WEF to the national grid. Overhead powerline Options A and B are similar, following the same 300 m corridor for most of their length, however Option B considers connecting via the predicted collector substation located approximately 200 m southwest of the existing Eskom Paulputs Substation.

In terms of the three overhead power line grid connection options, there is little difference. Option C is slightly preferable as Options A and B are longer and run through a CBA 2 towards the existing Eskom Paulputs Substation.

Internal reticulation between onsite substation Option A and Option C is approximately 6.5 km of overhead powerlines, assessed as a 300 m wide corridor by the specialists.

Only one of the three main grid connection options will be utilised, and a portion of the line connecting the substation options depending on which proposed substation location(s) are chosen. Specialists assessed all proposed grid connection options as 300 m corridors, and all options are being applied for. Servitude area assessed by the specialists, took into account the worst case scenario, i.e. longest possible 31 m wide servitude of approximately 26.8 km - grid connection Option B with internal reticulation between on-site substations added.

6.6 Grid Connection Alternative Structures

The main purpose of the overhead powerline is to connect the proposed WEF to the national grid. Technologies change on a regular basis and the most environmentally friendly, reliable, cost effective and safest technology that is available and meets industry standards will be used. Alternatives are proposed for the type of structures which will support the overhead lines. These may include:

- Concrete, steel or wood monopoles (preferred);
- Guy line supported steel structures (small footprint);
- Free standing metal lattice towers; or
- Multi-pole structures such as H-towers or K-towers.

Refer to **Plates 6-1 to 6-4** for typical examples of these tower types. All aspects of the grid connection, including powerline and supporting structures would need to adhere to industry standards.

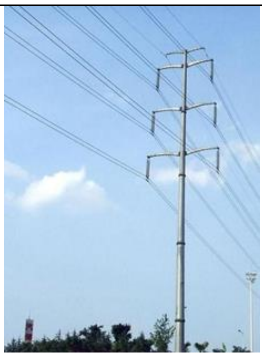


Plate 6-1: Concrete, steel or wood monopoles.

Plate 6-2: Guy line supported steel structures.

Plate 6-3: Free standing metal lattice towers.

Plate 6-4: Multi-pole structures such as H-towers or K-towers.

6.6.1 Alternative Structure 1 (Preferred)

The preferred supporting structure would be a concrete or steel monopole as these are the Eskom standard and are cost effective. They are also the preferred structure from an avifaunal perspective, and acceptable from a visual perspective. This preferred structure would be subject to line design and engagement with Eskom. From a visual perspective wooden poles are preferred due to their rural character. If steel is used it must not be painted but galvanized and allowed to oxidize naturally over time. The grey colour produced in this process will help to reduce the visual impact.

6.6.2 Alternative Structures 2 to 4

Free standing metal lattice towers are preferred from a visual perspective, as they blend into the landscape best. However, lattice and multi-pole structures are not preferred from an avifaunal perspective. Guy line supported steel structures and metal lattice towers are expensive and not required in terms of conducting capacity.

6.7 Routes to Site

Considering the site location, Saldanha Port is the preferred port for particularly large equipment and machinery for the proposed WEF.

Three routes (Coastal, N7 and Inland) were considered, as discussed below:

Coastal Route: This route was considered to avoid the N7 as far as possible, gaining access to the N7 at Clanwilliam.

- From Saldanha Port to Velddrif (along R27) (road in good condition),

- Along R399 to Main Road through Dwarskersbos (road in fair condition),
- Along Main Road towards Elandsbaai (Road in poor condition with potholes and extensive patching),
- Along Main Road (R366) turning north into south-north orientated road (approximately 5 km from Elandsbaai) and heading north towards Leipoldtville (roads in poor condition),
- Along R365 (road in poor condition with extensive patching) onto the south-north orientated road near Leipoldtville that links the R365 to the R364,
- From the R364 travel east past Graafwater, to join the N7 near Clanwilliam,
- From Clanwilliam the route follows the N7 northwards towards Springbok,
- At Springbok the route takes the N7 northbound off-ramp to travel east along the R355,
- The route follows a short section of the R355 and turns north to follow the N14,
- The N14 turns east into Voortrekker Road (N14),
- The N14 passes through Pofadder to reach the proposed Paulputs WEF located on the N14, some 32 km east of Pofadder.

The Coastal Route has a similar travel time to the N7 Route despite it being 30 km shorter than the N7 route. The Coastal Route is however not recommended due to the poor condition of the coastal roads north of Dwarskersbos, with extensive patching and pothole repair currently underway. Heavy vehicle traffic will exacerbate the deterioration of these roads

Inland Route:

- The route starts at Saldanha Port and follows the Port access road;
- The route turns east at the west-east orientated route (i.e. turn east at the link road between the R399 and the R27 that is planned to cross the R27 and join the R45);
- At the junction with the R27, the route turns north and follows the R27 towards Velddrif;
- At Velddrif the route turns east along the R399 to join the N7 south of Piketberg;
- The route then follows the N7 towards Vanrhynsdorp;
- At Vanrhynsdorp the route turns eastwards onto the R27 and follows the R27 through Calvinia and Kenhardt to join the N14 at Keimoes;
- The route follows the N14 westwards through Keimoes and Kakamas towards the proposed Paulputs WEF, located just west of MR759.

The Inland route is not recommended and should be avoided. It presents a considerably longer travel distance (adds 158 km) and would add some 2 hours to a normal journey. More critically though, it also traverses the Vanrhyns Pass that has tight horizontal curves to negotiate. The horizontal curvature with super elevation on Vanrhyns Pass will be particularly problematic for super-load vehicles.

N7 route: This is the recommended route for the proposed WEF project (see Figure 8.7 below), with the N7 and N14 being in a good condition.

- The route starts at Saldanha Port and follows the Port access road;
- The route turns east at the west-east orientated route (i.e. turn east at the link road between the R399 and the R27 that is planned to cross the R27 and join the R45);
- At the junction with the R27, the route turns north and follows the R27 towards Velddrif;
- At Velddrif the route turns east along the R399, turns north at Lang St, and joins the N7 south of Piketberg;
- The route then follows the N7 towards Springbok;
- At Springbok the route takes the N7 northbound off-ramp to travel east along the R355;
- The route follows a short section of the R355 and turns north at the N14;
- The N14 turns east into Voortrekker Road (N14);
- The N14 passes through Pofadder;

- The proposed Paulputs WEF is located on the N14, some 32 km east of Pofadder.

The Piekenierskloof pass (near Citrusdal) presents some challenges for super-load vehicles, i.e. extra-long vehicles transporting wind turbine blades, particularly on sharp horizontal curves.

It is noted that a new interchange is being built at the intersection of the R27 / west-east orientated route serving Saldanha Port. The west-east route is being extended east of the R27 to link to the R45). Very long vehicles (i.e. carrying wind turbine blades) would need to turn-left at the interchange on-ramp to access the R27, but on returning to Saldanha Port, would need to turn-right on the interchange off-ramp (assuming a diamond interchange). The detail design of the interchange would need to be assessed to determine suitability for super-load vehicles carrying long sections such as turbine wind blades. It is assumed that the important interchange serving the Saldanha Port access to the R27 is designed to accommodate some larger transport vehicles, but the extent of this needs to be ascertained. Where necessary an alternative route of temporary bypass lane would need to be considered.

At Springbok, the route section takes the N7 northbound off-ramp and turns right onto the R355, turns left at the R355 intersection with the N14 and turns right at Voortrekker Street (N14), all requiring intersection adjustments to accommodate particularly long vehicles.

Two-way traffic flow service level (at Level of Service E) are some 2500 passenger car vehicles per hour (pcvph) on the 120 km/h rolling terrain sections of the N7, 1410 pcvph on the 80 km/h two-lane mountainous sections of the N7 (i.e. Piekenierskloof Pass near Citrusdal), and 2500 pcvph on rolling sections on other regional routes.

6.8 Alternative Assessment Summary

A summary of the assessed alternatives thus far, for development, location and technology is provided in Table 6.3 below. In addition, the layout alternatives of the proposed facility will be assessed in an iterative manner, taking into account the results of the specialist investigations. The Scoping phase layout was derived from preliminary sensitivity mapping supplied by the specialists before the initiation of the Scoping & EIA process. A Final Mitigated Layout has been submitted for authorisation. The layout was refined through the results of the EIA phase specialist studies and other new information (e.g. Eskom consultation) as assessed in the EIA Report.

The Alternatives assessment thus far has resulted in the project location, technology and proposed layout being the Preferred Alternative.

Table 6.3: Assessed Alternatives Summary – Scoping and EIA Phase

Alternative Type	Alternative description	Advantages	Disadvantages	Result
No Development	The proposed development does not proceed	• No change in current landscape or environmental baseline • No risk of negative environmental and social impacts	• Land use remains low agricultural, without benefits from complimentary land use • No additional electricity will be generated through renewable resources • No opportunity for additional employment (permanent or temporary) in an area where job creation is identified as a key priority • No socio-economic benefits for the community associated with the establishment of a renewable energy facility • The government will not be assisted in addressing climate change, energy security and economic development	Not reasonable
Preferred Location	The Proposed Development Site	• Good wind • Accessible for wind turbine delivery • Proximity to Eskom grid • Surrounding area not densely populated • Site is agricultural land with current land use low intensity grazing • Landowner consent • Low environmental sensitivities compared to other sites	• Possibility of cumulative impacts with neighbouring solar facilities • On a National road	Reasonable and feasible
Technology	Wind Energy Facility	• Emits no CO_2 and has no fuel costs • Can share land use with other activities • Small footprint (little habitat loss) compared to other means of equivalent electricity generation • Contributes to government renewable energy goals	• WEFs pose collision risk to birds and bats • Potential visual impact and impact on sense of place from N14 • Dependent on availability of wind	Feasible and reasonable

Alternative Type	Alternative description	Advantages	Disadvantages	Result
Technology	Photo-voltaic or concentrated solar	• Solar PV poses less risk to birds and bats	• Solar power has much larger footprint (habitat loss)	Reasonable, not feasible
Technology	Concentrated Solar Power	• No collision risk to bats	• CSP poses incineration and collision risk to birds and loss of foraging habitat • Risk of cumulative impacts including *inter alia* habitat destruction with surrounding solar facilities greater than for a wind energy facility	Reasonable, not feasible
Technology	Hydro-electric	• Almost no emissions and no fuel costs • Large-scale and stable electricity generation • No risk of collision for birds & bats	• No hydro-electric resources in area • Significant impact on the landscape and river systems	Not feasible
Technology	Biomass	• Carbon neutral over time	• More expensive than other forms of energy • Given the low agricultural potential of the area, biomass supply difficult to secure at present.	Not feasible
Technology	Coal-fired power plant	• Abundant resource • Stable and long-term electricity generation	• Emits high levels of CO_2, major pollutant and contributes to climate change • Coal mining impacts significantly on the environment	Not reasonable
Technology	Nuclear power	• Low carbon footprint with small amounts of raw material	• Most expensive form of energy; requires major investments • Safety concerns (highly radioactive raw and waste material) • Radioactive toxic waste product • Very long timelines until energy generation can start	Not reasonable or feasible
Design	Preferred Layout	• Maximises wind • Minimises negative impacts • Will be determined during EIA Phase following specialist recommendations	• Potential residual negative impacts	Reasonable and feasible

7 THE PREFERRED ALTERNATIVE - THE PROPOSED 300 MW PAULPUTS WIND ENERGY FACILITY AND GRID CONNECTION

The proposed development will consist of a maximum of 75 wind turbines, each with a maximum hub height of 140 m (maximum blade tip height 230 m). The blade length will be a maximum of 90 m and a maximum of 180 m for the rotor diameter. The final choice of turbine will be dependent on the technology available at the time of construction as well as technical and economic feasibility of the turbine models available.

The blades will be manufactured from fibre-reinforced with epoxy or polyester resin or equivalent performance materials and the towers will be of tapering or cylindrical tubular steel or steel/concrete construction. The nacelle, which is located at the top of the tower, houses the gearbox and generator.

The turbines are computer-controlled to ensure that each turbine faces directly into the wind during operation to ensure optimum efficiency. When not in operation the turbine may turn away from the wind if the wind is too strong to protect the drive train.

Three overhead powerline route options are proposed from three onsite switching station Option A, B and C to the existing Eskom Paulputs Substation or the existing 132 kV overhead powerline. Overhead powerline Options A and B are approximately 19.6 km in length, while overhead powerline Option C is approximately 12.5 km. The applicant is seeking approval of all three options. Depending on negotiations with Eskom, only one of the three options will be constructed.

The applicant is also considering the option of battery storage as part of the development. the battery storage will be housed on containers within the onsite substation area.

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.

7.1 Wind Energy Facility Components

The WEF will comprise components described below. It should be noted that as the design of the proposed development 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 Wind Turbine Generators and Hardstand Areas

The proposed WEF will comprise a maximum of 75 turbines with a total generation capacity of 300 MW. Each turbine will have a generation capacity between 3 MW as a minimum, and 6 MW as a maximum. If a generation capacity turbine greater than 4 MW is available and is used, the number of turbines will be reduced.

Each turbine will have a maximum height to blade tip of 230 m. The turbines will be three-bladed horizontal-axis design with a hub height of up to 140 m, a rotor diameter of up to 180 m and a blade length of up to 90 m. The exact turbine model has not yet been selected and will be identified based on the wind resource distribution, technical, commercial and site specific considerations.

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. On average, at wind speeds greater than approximately 25 m/s the turbines will automatically turn the angle of the blade to reduce energy capture (this is known as 'feathering') and eventually stop turning to prevent damage.

Each turbine will require a transformer that will be located within the turbine tower.

The turbines would be placed on steel and concrete foundations, each foundation area, including hardstand areas will occupying an area of up to 0.8 ha each in total (which includes the maximum total area that may need to be disturbed during construction of the foundation). The foundation areas are typically up to 5 m deep and will include concrete and steel plinths depending upon local ground conditions.

Each turbine requires an area of hard-standing to be built adjacent to the turbine foundation. This provides a flat, stable base on which to lay down the turbine components ready for assembly and erection and to site the two cranes necessary to lift the tower sections, nacelle and rotor into place.

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.

The crane hard-standing will be left in place following construction in order to allow for use of similar plant should major components need replacing during the operational phase of the proposed development.

After the wind turbines are decommissioned the site will be either be rehabilitated, or advanced wind turbines will be constructed. These are likely to have higher capacity, meaning either less of them will be required or that the WEF can have a larger capacity if the grid can evacuate it and the energy demand requires it.

7.1.2 Turbine Power Output and Transformers

When operating, the rotational speed of the rotor is multiplied through the gearbox, which drives the generator. This produces a three-phase power output which is transferred from the generator to a transformer located within the turbine.

The turbine transformer converts the electrical output from the turbine to a higher voltage, 33 kilovolt (kV), for internal reticulation purposes. Stepping up the voltage helps to reduce electrical losses and reduce the cost of reticulation within the site. Power generated from the turbines is transmitted back to the on-site substation via the underground site cables.

7.1.3 Electric Cabling and On-site Substation

The electricity from the turbines will be transferred via a 33 kV electrical cable network to 33/132 kV transformers located in the on-site substation compound. Presently three location options are being considered for the on-site substation compound of approximately 4 ha in extent - Option A, B and C (Figure 7.1). The applicant is seeking approval for all three substation locations. Where possible the cabling will be underground but the feasibility of this will be confirmed as the design progresses and in-depth geotechnical studies are conducted. The on-site substation will house electrical infrastructure such as transformers and switchgear to enable the energy to be transferred into the national grid. The substation itself is 1.1 ha. The operations and maintenance building including parking will be approximately 0.5 ha.

Underground cabling will link the turbines to each other and to the on-site transformer / control building. Detailed construction and trenching specifications will depend on the ground conditions encountered. Typically cables would be laid in a trench approximately 1 m deep and 0.5 m wide. To minimise ground disturbance, cables will be routed along the side of the access tracks where practicable.

7.1.4 Laydown Areas and Site Offices

Additional temporary laydown areas will be required for equipment and component storage during construction across the site. These areas will be levelled and compacted and used for component storage. Temporary infrastructure would include a site camp, laydown areas and a batching plant. Permanent site offices will also be established in this area. A maximum of 4 ha will be required for the construction laydown areas and site offices.

7.1.5 Internal Site Access Roads

The turbine locations will be accessed through a network of unsealed roads which will be established across the WEF Site. These access roads will be between 6 m and 12 m wide. A width of 12 m is required for curves in order to allow trucks transporting turbine components to turn. Such roads are required to facilitate access for the cranes and abnormal load deliveries of turbine components. Existing farm access roads will be upgraded and utilised where possible.

Some of the aggregate required for the construction of the on-site tracks may be sourced from cut and fill operations during construction from within the proposed development site with additional material imported from permitted quarries as required.

7.2 Electrical Grid Connection Components

The electrical grid connection will connect the Paulputs WEF to the existing Eskom Paulputs Substation or the existing 132 kV overhead powerline, approximately 15 km or 10.8 km respectively from the nearest on-site substation Option A. There are three grid connection options with regards to connecting the Paulputs WEF to the national grid. Specialists assessed a 300 m wide corridor for all three grid connection options. Overhead powerline Options A and B are approximately 19.6 km in length, while overhead powerline Option C is approximately 12.5 km.

Three on-site substation compound options, each of approximately 4 ha in extent, are being considered - Option A, B and C (Figure 7.1). The applicant is seeking approval for all three on-site substation locations.

At this stage it is known that Eskom in partnership with IPPs are constructing a collector substation adjacent to the existing Paulputs Substation on the farm portion belonging to the Koonkoosies II Project. This new collector substation is a possible future connection point for the proposed Paulputs WEF to the national grid. Overhead powerline Options A and B are similar, however Option B considers connecting via the collector substation located approximately 200 m southwest of the existing Eskom Paulputs Substation.

7.2.1 Establishment of a Servitude

A servitude is by definition "the right to use someone else's land for a specified purpose", in this case the right to erect, operate and maintain a power line, as well as access rights to carry out these activities. Ownership of the land remains with the original landowner who signs a servitude agreement and keeps overall responsibility for the land.

A topographical survey will be conducted along the grid connection corridor to inform the final route, location and design of the tower foundations, pylons and structures. Once the final servitude route has been confirmed construction of the power line begins. The servitude is generally cleared of wooded plant species and any protruding alien vegetation to reduce fire risk and prevent shortages with vegetation, in line with the Environmental Management Programme (EMPr) and Eskom requirements and guidelines.

Although existing roads and tracks will be used as much as possible, access roads for minor vehicles may be created for the construction phase as well as for periodic maintenance, in negotiation with the relevant landowner.

Vegetation will be cleared beneath the overhead powerline to create a two-track servitude "service" road of approximately 5 m in width and 26.8 km (worst case scenario - grid connection Option B with internal reticulation between on-site substations added) for 4x4 vehicles to be able to access and monitor the servitude. The servitude will run the length of the overhead powerline excepting for spans across existing structures.

7.2.2 Grid Connection Tower Structures

The type of structures which will support the overhead lines is yet to be determined and may include:

- Concrete, steel or wood monopoles;
- Guy line supported steel structures;
- Free standing metal lattice towers; or
- Multi-pole structures such as H-towers or K-towers.

The preferred type of tower is dependent on a variety of factors, including the terrain, cost, conductor size, live line compatibility and required electrical characteristics. Currently the preferred is the concrete, steel or wood monopoles. Tower type selection will therefore be based on additional on-site investigations during the detailed design phase of the project. Similarly, the foundation size and type will depend on the type of tower selected as well as conditions of the local terrain. Tower steel is typically delivered on a 24-ton truck, or on smaller vehicles in difficult terrain. The tower structures are assembled on the ground and erected on the constructed foundations using an 8-ton crane truck. Following this the power lines and conductors are strung from tower to tower. The average span between two 132 kV towers is 200 m but can vary between 150 and 375 m depending on the terrain and ground profile.

7.3 Battery Storage

Paulputs WEF is also considering the potential of including energy storage as part of the WEF design.

The energy storage market is currently subject to a large degree of uncertainty and it is not yet known exactly what form the energy storage facility is likely to take, however it is expected to be a battery storage facility. Battery storage arrays can be modular, housed within shipping containers or within larger bespoke buildings (Plate 7.1). The Paulputs WEF parameters included in the assessment will therefore cover a wide range of scenarios to ensure that the operational scheme can provide the necessary electricity management services to the National Grid and be commercially viable.

The proposed design for the energy storage facility comprises an approximately 40 megawatt hour (MWh) battery array which will be located within each of the three electrical compounds within the site. This battery array has been designed using a modular, fully integrated, AC-coupled industrial energy storage system which consists of three types of enclosure:

- Rechargeable lithium-ion battery pack cabinets (10 x 40 ft.);
- Inverter; and
- System controller.

It is anticipated that the energy storage facility will be within each substation compound and contained within the 1 ha temporary laydown area adjacent to the on-site substation within the compound, additional space will not be required.

Plate 7.1: Example of a Battery Storage System

7.4 Location and Description of the Proposed WEF and Grid Connection Site

The proposed Paulputs WEF is located approximately 50 km (centre point of the site) northeast from Pofadder in the Northern Cape Province and approximately 80 km northwest of Kakamas (Figure 1.1). The proposed Paulputs WEF is situated in two (2) district municipalities, i.e. the Namakwa District Municipality and the ZF Mgcawu District Municipality, and falls within the Khâi-Ma Local Municipality and the Kai !Garib Local Municipality. Table 7.1 and 7.2, and Figure 7.1 provide details of the affected farm portions and their landowner details. WEF site landowners are indicated in Table 7.1 and Grid Connection landowners in Table 7.2 below.

Table 7.1: Paulputs WEF Landowner Details

Farm	Portion	Owner	SG Codes	Size
Farm 92	Portion 2	IZAK JACOBUS MARTHINUS VAN DEN HEEVER	C03600000000009200005	1573.07
Farm 92	Portion 3	FLORES JOHANNES VAN DER COLFF	C03600000000009200003	948.99
Farm 92	Portion 5	FLORES JOHANNES VAN DER COLFF	C03600000000009200005	1573.06
Farm 93	Portion 1	FLORES JOHANNES VAN DER COLFF	C03600000000009300001	3193.78
Farm 93	Portion 2	FLORES JOHANNES VAN DER COLFF	C03600000000009300002	2895.08
Farm 93	Portion 4	MARIA MARGARETHA CLASINA STRAUS	C03600000000009300004	2895.36

Table 7.2: Paulputs WEF Grid Connection Landowner Details

Farm	Portion	Owner	SG Codes	Size
Farm 140	Portion 1	T G N BOERDERY TRUST	C03600000000014000001	2607.09
Farm 91	Portion 1	NICOLAAS MICHIEL BRAND	C03600000000009100001	5040.03
Farm 92	Portion 4	KAXU CSP SOUTH AFRICA PTY LTD, ABENGOA	C03600000000009200004	3507.63

Farm 92	Portion 6	KONKOONSIES TRUST	C03600000000009100006	1713.12
Farm 92	Portion 1	KONKOONSIES TRUST	C03600000000009200001	3507.64
Farm 92	RE	T G N BOERDERY TRUST	C03600000000009200000	5447.92
Farm 92	Portion 2	IZAK JACOBUS MARTHINUS VAN DEN HEEVER	C03600000000009200005	6066.31
Farm 92	Portion 3	FLORES JOHANNES VAN DER COLFF	C03600000000009200003	948.99
Farm 92	Portion 5	FLORES JOHANNES VAN DER COLFF	C03600000000009200005	1573.06
Farm 93	Portion 1	FLORES JOHANNES VAN DER COLFF	C03600000000009300001	3193.78
Farm 93	Portion 2	FLORES JOHANNES VAN DER COLFF	C03600000000009300002	2895.08

8 DESCRIPTION OF THE BASELINE ENVIRONMENT

This section of the EIA Report provides the description of the baseline environment of the proposed development site (within which the proposed project lies). This section highlights the significant findings of the site visits and desktop studies undertaken by the specialists.

8.1 Climate

Climatic data available for Pofadder, indicates that the portion of the Northern Cape in which the wind farm is proposed experiences an arid climate comprising hot, dry summers and cool, very dry winters. Climatic data available from January 2009 to December 2018 indicates that the average maximum daily temperatures vary from 34˚C in January to 18˚C in July (WWO, 2019). Corresponding average minimum temperatures for these months are 24˚C and 8˚C, respectively. The mean annual precipitation over this ten-year period is approximately 108 mm per annum, falling mainly during the summer months due to low pressure systems developing over the hot arid landscape which draws cooler moist air from the coastline, resulting in periodic and brief thunder showers. The average monthly rainfall distribution is shown in Plate 8.1. The low rainfall is a very significant agricultural constraint that seriously limits the level of agricultural production possible. Water availability is severely constrained.

Climate is a pivotal factor for geotechnical considerations as it determines the mode and rate of rockmass weathering and thus the formation of soils. Evaporation far exceeds precipitation and in general the region lacks surface water. This indicates that, although chemical decomposition of rockmasses may occur in localities where water may be abundant (viz. preferential drainage paths such as fault and joint planes), mechanical disintegration of rockmasses is the predominant weathering mechanism in Pofadder and surrounds.

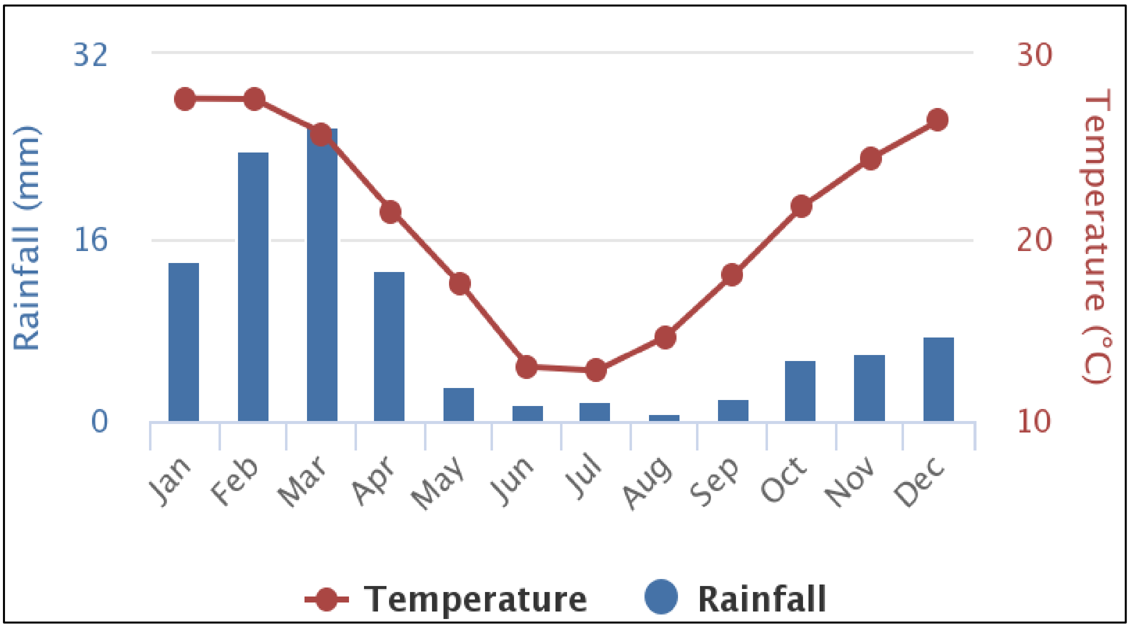


Plate 8.1: Average monthly temperature and rainfall for location (-28.92, 19.54) from 1991 - 2015. This location is near the centre of the proposed development.

8.2 Geology, Soils and Agriculture

8.2.1 Topography

The proposed development is located on a level plain at an altitude of around 800 metres above sea level. The slope across the area is approximately 2 % (Figure 7.2). There are no perennial drainage courses on the site, only non-perennial ones typical of very arid environments, which only flow occasionally after significant rainfalls. Satellite imagery and available topographic data (map sheets 2819 DD, 2820 CC, 2919 BB, 2920 AA) indicate that the Paulputs wind farm is located on flat topography with a shallow downward inclination (less than 5°) in a north/ north - west direction towards the Orange River. Major drainage paths, all of which are non-perennial, are located east, west and south of Paulputs. Any rainfall that does occur in the area is drained from rather than into the boundaries of Paulputs.

Localised thundershowers typical in the region combined with sparse vegetation suggest that the area is prone to rapid and turbulent runoff in the highland whilst slower sheet wash is expected in the lowland.

8.2.2 Agricultural Potential of Soils

The proposed development footprint is classified with a predominant land capability evaluation value of 4, although it varies from 3 to 7. Agricultural limitations that result in the low land capability classification of the proposed development location are predominantly due to the extremely limited climatic moisture availability. The long term grazing capacity of the site is low at 36 hectares per large stock unit.

The majority of the sites land use is bare non-vegetated, with some woodland/open bush and low shrubland areas (Figure 7.3). The area is a sheep farming area. The climate does not support any cultivation and low intensity natural grazing is the only current and viable agricultural activity. The only agricultural infrastructure in the area are wind pumps, stock watering points and fencing surrounding grazing camps. There are no farmsteads (that is a residential and administrative node of buildings and infrastructure from which a farm is managed) within the study area, but there are dwellings.

The entire study area has extremely low agricultural potential and therefore very low agricultural sensitivity to development and consequent loss of agricultural land use. Agricultural potential and conditions are also very uniform across the site, and the choice of placement of facility infrastructure, including access roads and transmission lines therefore has negligible influence on the significance of agricultural impacts. From an agricultural point of view, no parts of the site need to be avoided by the proposed development and no buffers are required.

8.2.3 Geology

The underlying geology is predominantly migmatite, gneiss and granite. Small outcrops of ultrametamorphic rocks occur in places (Namaqualand Metamorphic Complex). Lime nodules and calcrete are abundant and dorbank occurs in places. The proposed infrastructure is located entirely on a single land type, Ag3, although a small part of it extends into a second land type, Ag2, and the grid connection extends into a third, Ag37. Soils of these land types are very similar, predominantly shallow, sandy to loamy, well drained on underlying rock, dorbank or hard carbonate. Dominant soil forms are Hutton and Mispah. The environment does not pose a high water erosion risk. Mitigating factors are the low slope, low rainfall, rock outcrops and high permeability of the sandy soils. Because of their sandy texture the soils are however susceptible to wind erosion. Surface disturbance always poses an erosion risk.

Paulputs may be underlain by two terranes, comprising lithostratigraphic unit (ii) which has been intruded by lithostratigraphic unit (iii). The two terranes and their prime lithological units (Cornwell et al, 2006) are as follows:

- Namaquan Period: Richtersveld Subprovince: comprising low to medium grade metamorphosed volcano-sedimentary sequences and extensive granitoid intrusions
- Namaquan / Kheisian Period: Bushmanland Terrane: comprising medium to high grade gneisses, volcano-sedimentary sequences and granitoid intrusions

A review of the geological map of Onseepkans (map series 2818, 1:250 000 scale) indicates that Paulputs is underlain by the Richtersveld Subprovince. The stratigraphic units anticipated within the boundaries of Paulputs include Bladgrond and Gemsbokvlakte gneiss and Skuitklip granite all of which have been intruded locally by younger dolerite dykes. Overlying these predominantly intrusive rock types are quaternary age surficial clayey/ sandy soils and gravels. These soils are predominant in the low lying regions and primarily comprise of in-situ residual derivatives of the granite and dolerite rocks or transported versions thereof. Whereas soils on the nearby foothills and mountain slopes are primarily disintegrated debris from the mechanical weathering of their parent rockmass.

Due to intense temperature fluctuations and sporadic/ sudden precipitation in the area, localised cementation of calcareous minerals and oxidation of ferrous minerals has occurred in these surficial deposits resulting in nodule formation, weakly cemented/ oxidised soils and/ or calcrete and ferricrete hardpan (pedocretes).

8.2.4 Seismicity

South Africa is located on the African Tectonic Plate which, in comparison to other tectonic plates, is fairly stable with low degrees of movement. Much of the African Plate - except the East African Rift Zone - can be considered to be a zone of low tectonic activity. This does not suggest that no seismic activity occurs but rather that the probability of same is much lower. Seismic hazard is represented by the peak horizontal ground acceleration (PGA) of any particular area: the greater the PGA the greater the probability of seismic activity.

Seismicity data compiled by the Council of Geoscience (2011) provides probable ground accelerations for South Africa based on historic earthquake activity. This data reveals that Paulputs is situated within an area of medium susceptibility to seismic activity. The seismic activity is categorized as strong (degree VI) in terms of the modified Mercalli scale which suggests that the region is susceptible to peak horizontal ground accelerations of 0.5 - 1.0 m/s^2. This level of seismicity is indicative of a 10 % probability of exceeding the peak ground acceleration in a 50 year period.

The degree of seismicity anticipated at Paulputs is in general higher than most parts of South Africa and is likely due to the numerous shear zones that separate the Namaqua-Natal Metamorphic Terranes. Paulputs is located adjacent to the Pofadder Shear Zone (PSZ) and thus the degree of seismicity in the surrounding area is likely attributed to sporadic shifts in pressure along this shear zone. Paulputs' vicinity to the PSZ, with associated probability of seismic activity, warrants the consideration of appropriate seismic load factors in the design of the proposed wind turbine structures. For this purpose a g-factor of no less than 0.1 should be considered at this pre-feasibility stage.

8.2.5 Geotechnical Evaluation

- The majority of the site and, in general the central portion, appears to be underlain by dolerite which has intruded granite parent rockmass;
- The site borders the Pofadder Shear Zone;
- There is a notable drainage lining bisecting the southern portion of the site (running roughly east to west); and
- There is a notable drainage line along the northern portion of the site (running roughly south to north).

The greatest geotechnical concerns towards the proposed turbine structures are highlighted hereunder. These concerns will form the objective of further geotechnical investigations for preliminary and detailed design of the structures.

- Thickness and variability in consistency of transported and residual soil horizons.
- Collapse and high settlement potential of transported and residual soil horizons.
- Density/ stiffness of pedocrete lenses and influence on founding solutions.
- Extent of residual soil and degree of rockmass weathering at zones where dolerite has intruded granite.
- Extent of rockmass fracturing and weathering along the southern boundary near the Pofadder Shear Zone.
- Depth to and undulating nature of foundation rockmass across the site as a whole.
- Extent of influence of Pofadder Shear Zone on local geology and seismicity.

8.3 Freshwater and Wetlands

The proposed development occurs within the following catchments within the Nama Karoo ecoregion:

- D81E Samoep
- D81F Kaboep

The above-mentioned mainstem catchment systems are short tributaries of the Orange (Gariep) River, which are largely ephemeral alluvial systems. Overall, these catchment and subsequent rivers / watercourses are largely in a natural state.

Current impacts occur in localised areas and included the following:

- Erosion due small road crossings and tracks; and
- Grazing.

Absent from the study area (inclusive of a 500 m buffer) are any wetlands. This was confirmed during the site visits. Thus, the systems within the study area are alluvial river systems, characterised as natural sediment transport mechanisms within the regional environment. The lack of any natural wetlands (pans and or valley bottom systems) was also substantiated by the National Wetland Inventory v5.2 spatial data, although this data set did indicate a number of pans/depressions that were confirmed as rocky outcrops in this assessment.

In terms of the National Freshwater Ecosystems Priority Areas (NFEPA) assessment, all the watercourses within the site have been assigned a condition score of AB (Nel et al. 2011), indicating that they are largely intact and of biological significance. This is largely due to these catchments falling within the Orange River, within a section rated B (Largely Natural). However, as the study area systems are mostly ephemeral, the observed site systems don't support any wide riparian zones and the vegetation associated with these watercourses was between 0.5 m and 12 m wide and was mostly terrestrial.

The National Freshwater Ecosystems Priority Areas (NFEPA) (Nel *et al.*, 2011), also earmarked sub-quaternaries, based either on the presence of important biota (e.g. rare or endemic fish species) or conversely 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 (FEPAs). The survey area falls within a Fish FEPA, associated with the Kaboep River, although no permanent fish habitat occurs within the proposed site.

Significant watercourses delineated with a 45 m buffer within the site are presented in Figure 12.1 Environmental Sensitivity Map. Any activities within these areas or the 32 m buffer will require a Water Use license (possible General Authorisation) under Section 21 c & i of the National Water Act (Act 36 of 1998).

8.3.1 Present Ecological State and Conservation Importance

The Present Ecological State (PES) 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 PES scores for the main watercourses in the study area (Table 8.1) were rated as per DWS, 2014 - where A = Natural or Close to Natural.

Table 8.1: Present Ecological State of Main Watercourses in the Study Area

Subquaternary Catchment Number	Present Ecological State	Ecological Importance	Ecological Sensitivity
3445	B	High	High
3449	C	High	High

These scores were substantiated by field observations and due to the overall lack of impacts or disturbances these scores should be upheld. This was further substantiated by the inclusion of the lower portions of the Kaboep River and upper Samoep River into Critical Biodiversity Areas (Type 1 and 2) and Ecological Support Area.

8.4 Flora and Terrestrial Fauna

8.4.1 Vegetation types

The footprint of the facility as well as the power line options are restricted to the Bushmanland Arid Grassland vegetation type. This vegetation unit is the second most extensive vegetation type in South Africa extending from around Aggeneys in the west to Prieska in the east. It is associated largely with red-yellow apedal (without structure), freely drained soils, with a high base status and mostly less than 300 mm deep. Due to the arid nature of the unit it has not been significantly impacted by intensive agriculture and more than 99% of the original extent is still intact. As a result it is classified as *Least Threatened*. Mucina & Rutherford (2006) list 6 endemic species for the vegetation type which is relatively few given its extensive nature.

The majority of the site and footprint occur on the open plains of the site with some areas of gravelly hills, rocky outcrops, washes and some dunes. The different habitats, with characteristic species and discussion on their sensitivity, are described fully in the Specialist Report (Volume III).

Rocky outcrops are considered sensitive, however, the extent of these are limited and do not pose a significant limitation for the development. There are no well-developed drainage features within the site, although there are several washes present which occasionally receive runoff from adjacent areas. Areas with dunes are considered not suitable for development due to their vulnerability to disturbance.

8.4.2 Mammals

The site falls within the known distribution range of 43 terrestrial mammals, indicating that the site has moderate potential mammalian diversity. Diversity and activity levels as observed by the camera traps was however low and dominated by a few common species, mainly Cape Fox, Bat-eared Fox and Aardwolf. Species observed either during the current camera trapping survey or previously on neighbouring properties include the South African Ground Squirrel, Hairy-footed Gerbil, Aardvark, Aardwolf, African Wild Cat, Cape Hare, Hewitts' Red Rock Rabbit, Yellow Mongoose, Cape Mongoose, Striped Polecat, Cape Fox, Bat-eared Fox, Black-backed Jackal, Small-spotted Genet, Steenbok, Springbok, Gemsbok and Meerkat. The only listed mammal which may occur at the site is the Black-footed Cat *Felis nigripes*, which is listed as *Vulnerable*. There is a reasonable probability that the black-footed cat occurs in the area as the habitat is broadly favourable for this species, but it is widely distributed across the arid and semi-arid areas of South Africa and the habitat loss that would result from the development would be minor in relation to the distribution of this species.

The rocky hills are highlighted as the most important habitat for fauna at the site. These are of limited extent and can be easily avoided by the development.

8.4.3 Reptiles

The site lies in or near the distribution range of at least 46 reptile species, indicating that the site has potentially quite high reptile diversity. Given the range of habitats available at the wider site, a large proportion of these are likely to occur in the area. Based on the distribution records and habitat requirements, the composition of the reptile fauna at the site potentially comprises 1 tortoise, 17 snakes, 19 lizards and skinks, 8 geckos and 1 chameleon. Species confirmed present include the Namaqua Sand Lizard *Pedioplanis namaquensis*, Ground Agama *Agama aculeata*, Western Rock Skink *Mabuya sulcata* and Karoo Sand Snake *Psammophis notostrictus*. The only listed species which may occur at the site is the Black Spitting Cobra *Naja nigricollis woodi*, which is likely to occur in the vicinity of the rocky outcrops as well as other areas with sufficient cover. Although this species is a regional endemic, it is common within its range and the extent of habitat loss resulting from the development would be minimal.

The rocky outcrops are the most important habitat in the area for reptiles as they provide cover and structure for a wide variety of lizards, geckos, skinks and snakes. This habitat is however of very limited extent and it is likely that it can be avoided by the development. The open plains habitat of the site that would be impacted by the development has relatively low reptile diversity and the overall extent of habitat loss associated with the development would not represent significant habitat loss for the species present. The overall impact of the development on reptiles is likely to be local in nature and there are no species that would be particularly affected by the development.

8.4.4 Amphibians

The site lies within or near the range of six amphibian species, indicating that amphibian diversity at the site is not likely to be very high. The only areas where some naturally occurring standing water may occur is on some rocky basement areas which occur along the power line corridors, where there may be rock potholes and crevices that contain water after rain. These are the only areas that offer potential breeding sites for those species which require water for their tadpoles such as toads and the marbled rubber frog. These areas aside, the only other areas where amphibians may be present are occasional earth dams that may occasionally have water and the dunes and larger drainage lines where burrowing species such as Sand Frogs may be present. Overall abundance and diversity of amphibians at the site is likely to be very low and as a result, long-term impacts on amphibians are likely to be very low.

8.4.5 Listed and Protected Plant Species

There are not a lot of plant species of high conservation concern known from the study area and surrounds, based on existing records for the area. The field assessment however revealed that there are numerous quartz outcrops in the wider area which are considered sensitive features as they usually contain a variety of specialised and protected plant species including various *Lithops*, *Conophytum* and *Anacampceros* species. Although there are some areas with quartz gravel on the surface present at the site, these are poorly developed and although they were thoroughly searched no species of significance were found to be associated with these areas. In terms of protected species observed on the site, the nationally protected tree *Vachelia erioloba* is present at a very low density on the site. Given the very low density of this species, an impact on this species is not likely and it can be easily avoided. The protected trees *Boscia foetida* subsp. *foetida* and *Boscia albitrunca* are also present at moderate density. Although there is some potential for impact on these species, previous experience on wind farms that have proceeded to construction where these species were present at a much higher density, suggest that individuals of these species can be well-avoided through a preconstruction walk-through and fine-scale routing of the access roads and turbine locations. As such, a significant impact on these species is not considered likely provided that the preconstruction walk-through is used to adjust the final development footprint to minimise impact on these and other listed and protected species. The protected succulent *Hoodia gordonii* is present on the site at a very low density and only a handful of plants were observed across the site. Due to the low density of this species it is likely that it can be avoided and a long-term impact on this species is not likely.

Perhaps the species of greatest potential concern at the site is *Aloidendron dichotomum*. Although it is likely that individuals of this species can be avoided at the preconstruction stage, a greater long-term threat is likely to be illegal harvesting of young individuals associated with the greater access to the site resulting from the wind farm development. In order to limit, prevent and address any potential decline in this species, a long-term monitoring programme should be developed and initiated before construction. The programme should, at minimum, include the following parameters and activities:

- Size and GPS location of all *Aloidendron dichotomum* plants found on site. Photographs of all individuals present is also recommended for documentation purposes.
- Annual monitoring of size-class structure, including any new deaths, disappearances, and seedlings that have appeared.
- If any seedlings and young plants disappear, then the local populations should be supplemented with seedlings cultured from seed collected on-site.
- There should be signage present at all entrances to the site warning against the illegal collection of any fauna and flora.

It is important to note that a permit from DAFF would be required for any impacts on nationally protected tree species, while a permit from DENC would also be required for general clearing and any clearing or removal of provincially protected species. These permits would be informed by a preconstruction walk-through of the final development footprint.

8.4.6 Critical Biodiversity Areas

Most of the site is identified as "other natural areas" and have not been identified as being important for biodiversity conservation, however, there are also some ecological support areas associated with the larger drainage systems of the site and a relatively small CBA 1 in the centre of the site which currently has a number of turbines. Correspondence with DENC indicates that this area has been identified as a CBA based on the presence of Quiver Trees (*Aloidendron dichotomum*) within the site. This species was confirmed present at the site at a low density. With the appropriate avoidance, direct impact on this species can be entirely avoided. The development would however result in some habitat loss across the site. However, this is not likely to affect the local population of *Aloidendron dichotomum*. A more direct threat would likely be poaching and harvesting of young trees by construction or operational phase personnel on the site. Specific mitigation should be implemented during construction and operation to reduce this risk. Overall, provided that impact on *Aloidendron dichotomum* can be avoided, then some limited development within the CBA area is considered acceptable from an ecological stand point. However, as this area still contributes to meeting targets, represents habitat for *Aloidendron dichotomum* and is currently in a moderate condition, the overall extent of the development footprint in this area should be limited.

In terms of the potential impact of the development on protected area expansion strategy focus areas, there are no focus areas within the site and as such, no impact on national or provincial conservation expansion priorities would be impacted by the development. The only focus area in the vicinity of the site is north of the site and would not be impacted by the development.

Northern Cape Department Environment and Nature Conservation (DENC) conducted a site visit on 19 August 2019 and provided comment which is responded to in the Comments and Responses Trial (Volume II).

Relevant extracts with regard to the CBAs on site from comment provided by DENC subsequent to the site visit conducted on 19 August 2019 are provided below:

- '*The site visit revealed that individuals of this protected species* [Aloidendron dichotomum] *- mostly juvenile size - do in fact occur, but that they are scattered and in very low densities. The species in fact occurs in low densities over a wider area than the CBA1 mapping unit, but similarly in low densities.*';
- '*The layout plan for the position of wind turbines have already considered the location of drainage lines, the volcanic "koppies" and the mountainous ridge to the*

southwest (buffered), and has been adjusted accordingly. The developer and EAP indicated that due to the homogenous nature of the landscape in the project area there is a fair amount of flexibility possible to avoid any environmental sensitivities. The developer should therefore be able to avoid A. dichotomum *trees.*'; and

- '*Based on the cursory inspection of the area it is difficult to justify the presence of the CBA1 polygon within the project area, as there are no major environmental sensitivities present except for the low density presence of some protected plants species (which also occur in the surrounding landscape). In fact, the CBA 2 designation for the surrounding hills outside of the project area are arguably of higher sensitivity. The presence of species of conservation concern is a valuable variable used in the CBA designation methodology, but this case shows that it could be interpreted on a case specific basis, in terms of species conservation status (Vu), the presence of the species and habitats over the larger landscape*.'

DENC comment concluded that '…*the environmental sensitivities over the project area is adjudged to be low for this development*…'

8.4.7 Site Sensitivity Assessment

The majority of the site consists of open grassy plains considered to be low sensitivity. There are also some low gravelly hills within the development footprint which are considered to be moderate sensitivity and also considered suitable for development. Sensitive features present which should not be impacted include the rocky outcrops within the site and the bedrock pans which occur along the power line corridors. Features where the development footprint should be minimised include the washes within the site and the dunes which occur along the power line corridors.

Diversity of fauna and flora within the site is relatively low and the affected habitat is not considered to be of broader ecological significance as it is typical of the area and is widely available. There are however some protected plant species within the site, most notably, *Hoodia gordonii*, *Aloidendron dichotomum* and *Boscia foetida*. The abundance of these species within the site is low and is likely that impact on these species can be reduced to a very low level and it is not likely that the local populations of these species would be compromised by the development.

8.5 Avifauna

8.5.1 Co-ordinated Avifaunal Road Counts (CAR)

There are no CAR routes on the WEF site or within 400 km of the WEF site, and therefore data from this source is not considered relevant to this study.

8.5.2 Co-ordinated Waterbird Counts (CWAC)

There are no CWAC sites within 190 km of the proposed WEF site, and therefore data from this source is not considered relevant to this study.

8.5.3 Important Bird Areas

The proposed WEF site is not situated within an IBA. However, the Mattheus-Gat Conservation Area (Global IBA) borders the proposed development site to the south west. A red dune system runs through the centre of the IBA, orientated from north-west to south-east. Small quartzite hills and gneiss-granitic inselbergs form islands of rocky habitat in a sea of red sand. This IBA is one of a few sites protecting the globally threatened Red Lark, which inhabits the red sand dunes and sandy plains with a mixed grassy dwarf shrub cover, and the near-threatened Sclater's Lark, which occurs erratically on gravel plains. The site potentially supports 16 of the 23 Namib-Karoo biome-restricted assemblage species and a host of other arid-zone birds. It is seasonally important for nomadic larks, such as Stark's Lark, and sparrow-larks, which are abundant after good rains. The number of known species for this IBA is 142. It appears that the Red Lark population has declined in this IBA. Globally threatened species that occur in the IBA are Red Lark, Sclater's Lark, Kori Bustard, Ludwig's Bustard and Black Harrier. Karoo Korhaan also occurs in the IBA which is regionally threatened. Biome-restricted species include Stark's Lark, Karoo Long-billed Lark, Black-eared Sparrow-lark, Tractrac Chat, Sickle-winged Chat, Karoo Chat, Layard's Tit-Babbler, Karoo Eremomela, Cinnamon-breasted Warbler, Namaqua Warbler, Sociable Weaver, Pale-winged Starling and Black-headed Canary. Besides these trigger species, Martial Eagle, Secretarybird, Verreaux's Eagle, Booted Eagle, Black-chested Snake Eagle, Cape Eagle-Owl and Spotted Eagle-Owl are present.[17]

The proposed development site does not contain the red dune and sandy plains habitat suitable for Red Lark, and Red Lark has not been recorded in SABAP1 or SABAP2 data, or during four seasons of pre-construction monitoring on the WEF site. Therefore an impact on this species by the proposed development is unlikely. Likewise Sclater's Lark has not been recorded during pre-construction monitoring or by SABAP2. It was however recorded during SABAP1 for the larger quarter degree square. The proposed WEF is however more likely to impact on priority species listed in the IBA that are possibly at least occasionally present on the proposed development site, such as Kori Bustard, Ludwig's Bustard, Black Harrier, Martial Eagle, Secretarybird, Verreaux's Eagle, Booted Eagle, Black-chested Eagle, Cape Eagle-Owl and Spotted Eagle-Owl.

8.5.4 Southern African Bird Atlas Project 1

The SABAP1 data (Harrison *et al.* 1997) 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. This data was collected in quarter degree squares, with the WEF and grid connection site situated in squares 2918DC, 2819DD, 2919BA and 2919BB. The SABAP1 project recorded a total of 18 priority species and raptors.

8.5.5 Southern African Bird Atlas Project 2

This project is part of an ongoing study by the Animal Demography Unit (ADU), a research unit based at the University of Cape Town (UCT). SABAP2 data was examined for the three out of six pentads covering the site for which data exists. These were pentads 2855_1940, 2945_1720, 2945_1725, 2950_1715, 2950_1720 and 2950_1720. Pentads are roughly 8 km x 8 km squares, and are smaller than the squares used in SABAP1. A total of 4 full protocol cards have been submitted for these three pentads, in addition to 10 ad hoc protocol cards and 63 incidental records. This represents a very low counting effort and low amount of data for this area, and the data should be interpreted with caution. A total of 59 species have been recorded, including four Red Data species, six priority species and three near-endemic species.

8.5.6 Microhabitats

In order to determine which bird species are more likely to occur on the proposed project site, it is important to understand the habitats available to birds at a smaller spatial scale, i.e. micro habitats. Micro habitats are shaped by factors other than vegetation, such as topography, land use, food sources and man-made factors.

The WEF site has a low diversity of available bird micro habitats, with generally similar vegetation found throughout. The entire site falls within the Bushmanland Arid Grassland vegetation type. There are no wetlands or rivers of any importance for birds on the site.

[17] http://www.birdlife.org.za/conservation/important-bird-areas/iba-directory/item/175-sa034-mattheus-gat-conservation-area

The following bird micro habitats have been identified to date: arid grassland; drainage lines; rocky outcrops; powerlines, livestock water points; stands of alien trees and farmsteads.

The majority of the site consists of arid grassland, interspersed with few bushes and small trees. This micro habitat hosts a variety of passerines such as larks, sparrow-larks, chats, pipits, cisticolas, finches, warblers, sandgrouse, and also terrestrial priority species such as Karoo Korhaan and Northern Black Korhaan.

The few trees in the landscape are largely restricted to drainage lines and can host doves, Acacia Pied Barbet, tit-babblers, sunbirds, robin-chats, prinias and other passerines. They may also occasionally be used as perch sites or nest sites for raptors such as Greater Kestrel and Pale Chanting Goshawk.

Rocky outcrops are frequented by rock hyrax ("dassies") which are a favoured food source of Verreaux's Eagle, and potentially preyed upon by other raptors, even though this was not observed. Rocky outcrop micro habitats may also be utilised by warblers, buntings, wheatears, chats and other passerines.

Powerlines provide nesting habitat for corvids, kestrels, and sociable weaver, whose large communal nests are in turn utilised by Pygmy Falcon. They potentially also provide nesting habitat for raptors such as Lanner Falcon, Greater Kestrel and Martial Eagle.

Farmsteads and feeding kraals and watering points are mainly frequented by a large variety of small passerines but can also provide important habitat for smaller raptors and their rodent prey. Alien trees such as blue gums, mostly found around farmsteads, can be utilised as roosting and nesting sites by raptors, corvids and passerines. Farm dwelling such as barns may be frequented by Speckled Pigeon, sparrows, swallows and Western Barn Owl.

8.5.7 Paulputs WEF Pre-construction Monitoring

A total of 73 species were recorded across all survey methods during four seasonal surveys on the WEF and Control sites. This is a relatively low diversity of species compared with many other WEF sites in South Africa in the experience of the specialists. Of the species recorded, 63 were recorded on or near the WEF site, and six of these were Red data species: Karoo Korhaan (*Near-threatened*), Ludwig's Bustard (*Endangered*), Verreaux's Eagle (*Vulnerable*), Lanner Falcon (*Vulnerable*), Martial Eagle (*Endangered*) and Sclater's Lark (*Near-threatened*). A total of 11 priority species were recorded on the WEF site.

Ludwig's Bustard is the species of most concern occurring on the WEF site, as it is an endangered species, and was present in three of four seasons, albeit in low density. Ludwig's Bustard is particularly prone to collisions with powerlines (Shaw *et al.* 2017). As of October 2018 (BLSA, 2018) only one mortality of this species had been recorded at a WEF in South Africa (although the information considered was not clear whether it was due to turbine collision or not). The global population of Ludwig's Bustard is in decline, largely due to extensive and increasing power network in its region causing unsustainably high mortality rates (Jenkins *et al.* 2011).

Martial Eagle was only recorded once on the WEF site during VP watches, however it is generally uncommon outside of major game reserves and protected areas in South Africa. It is Red Data listed as *Endangered* and large declines have been detected over the past 20 years (Amar & Cloete 2017), with reporting rates dropping by 60%, relatively uniformly across South Africa. The population in the Eastern, Western and Northern Cape was estimated at 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) and 12 km in Kruger National Park (Tarboton & Allan 1984). Home ranges of tagged individuals in Kruger

National Park average 108 km^2 (van Eaden *et al.* 2017). These large territories show that this is a wide ranging species. It is also important to note that this species is monogamous and the pair bond is often maintained over several years, regularly re-using and breeding at the same nest site. A known nest site is located on a high voltage powerline pylon approximately 12 km from the WEF site boundary and it is likely that the recorded bird was from that nest. Therefore the WEF site is likely to be located at the edge of that pair's territory boundary. Martial Eagle has suffered four known mortalities through collisions with wind turbines in South Africa to date (BLSA 2018.) and is therefore a species of concern. However, the low incidence of occurrence recorded on the WEF site, together with the distance to the nest, make it less likely that this species will suffer mortalities. The presence of solar facilities planned and operational near it's nest site may however pose an additional risk, as the birds are likely to be required to increase their foraging efforts and range due lack of foraging habitat within their original territory. Construction of additional pylons in the area around the project site may provide additional nesting substrate for this species. Possible impacts on this species will need to be closely monitored during operational monitoring, with an adaptive management strategy in place should negative impacts be observed.

Verreaux's' Eagles was recorded once incidentally near the WEF site, and at its nest site 1.8 km from the proposed development site boundary and > 3 km from the nearest proposed turbine position. This species is territorial and their territories surround their nest sites, but their nests are not necessarily in the centre of their territory (Gargett 1990). The WEF site does not hold any suitable nesting habitat (i.e. cliffs). Nests are usually built on cliffs and ledges (Gargett 1990), although they have been recorded nesting on power lines and occasionally in trees or on telephone poles (pers. obs.). Verreaux's Eagle are predominantly found in mountainous, rocky habitat (Davies & Allan 1997), and the regional population (i.e. for South Africa, Lesotho and Swaziland) has been estimated to be between 3 500 and 3 750 mature individuals, but confidence in these figures is low (Taylor *et al.* 2015). Verreaux's' Eagle is an apex predator which plays an important ecological role. While no suitable cliff-nest habitat is on or near the WEF site, some suitable foraging habitat is potentially present on the WEF site, despite no observations having been made of Verreaux's Eagle on the WEF site during 240 hours of vantage point monitoring. Prey species such as Dassies have however been observed on site, therefore it is possible that the birds occasionally utilise the site for foraging. Therefore a pre-cautionary 3 km buffer surrounding the nest site is required in which no turbines may be placed.

Ten additional species were recorded on the Control site that were not recorded on the WEF site, including one priority species (Kori Bustard – *Near-threatened*). Most of these additional species are aerial foraging birds or associated with shrubby riverine or woodland habitats. The control site had some of this type of habitat, with a dry wooded sparsely wooded dry drainage line running through it, in addition to the open and sparsely vegetated habitat, interspersed with rocky outcrops, that dominates the WEF site.

It should be noted that a number of species listed as *endangered* regionally, or near endemic (i.e. ~70% or more of population in South Africa) were recorded on the WEF site. These area: Martial Eagle, Ludwig's Bustard (both endangered) as well as Black-eared Sparrowlark, Large-billed Lark, Karoo Prinia and Sclater's Lark (all near-endemic). The WEF site may potentially represent critical habitat (CH) for one or more of these species according to the critical habitat assessment (CHA) criteria presented in guidance note 6[18] of the International Finance Corporation (IFC) Performance Standard 6 (PS6).

[18] Guidance Note 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources. November 15, 2018.

8.6 Bats

8.6.1 Habitats

The predominant land use on the site is low intensity sheep grazing and currently there are no known impacts to bats on the site.

Resources present within the site that are important for bats include a low number of farm dams and artificial wetlands with associated trees, NFEPA rivers and drainage areas (these hydrological features are dry for most of the year), rocky outcrops and buildings.

8.6.2 Bat Species

Approximately 12 species of bat can potentially occur at the proposed site (African Chiroptera Report 2013; Monadjem et al. 2010). It is possible that more (or fewer) species may be present because the distributions of some bat species in South Africa, particularly rarer species, are poorly known. Analysis of the acoustic monitoring data suggests that at least five species of bat are present (Table 8.2). An additional one or two species may be present at the site but these could not be distinguished based on their echolocation data. Based on these data, either the Cape horseshoe bat, or Darling's horseshoe bat (or both) are present on the site. For analysis purposes these species were grouped bringing the total number of species recorded to six. These include three high risk species based on their foraging and flight ecology and/or migratory behaviour.

Table 8.2: Bat Species Recorded at the Project and their Sensitivity to WEFs

Species	Species Code	# Bat Passes	Conservation Status[19]		Likelihood of Risk
			National	International	
Egyptian free-tailed bat *Tadarida aegyptiaca*	EFB	14,777	Least Concern	Least Concern	High
Natal long-fingered bat *Miniopterus natalensis*	NLB	60	Least Concern	Least Concern	High
Roberts's flat-headed bat *Sauromys petrophilus*	RFB	2,071	Least Concern	Least Concern	High
Cape serotine *Neoromicia capensis*	CS	755	Least Concern	Least Concern	Medium-High
Long-tailed serotine *Eptesicus hottentotus*	LTS	4,613	Least Concern	Least Concern	Medium
Horseshoe Bat Species *Rhinolophus spp.*	HSB	5	Least Concern	Least Concern	Low

8.6.3 Spatio-Temporal Bat Activity Patterns

A total of 22,281 bat passes were recorded from 412 sample nights across the six species and across all bat detectors (Table 8.3). Across the site, bats were recorded on 95 % of all sample nights. Of these sample nights ca. 61 % had low to moderate activity, ca. 14 % had high activity, and ca. 5 % had very high activity.

Table 8.3: Acoustic Monitoring Summary

Detector	Altitude (masl)	# of Sample Nights	% of Sample Nights with Bat Activity	Median; Mean # of Bat Passes/night	Total number of Bat Passes
PAU1	987	411	67.3	2; 7.4	3,051
PAU2	940	412	86.2	8; 19.8	8,165
PAU3	938	412	71.4	3; 8.7	3,565
METLow	972	348	79.3	4; 14.0	4,868
METHigh	1,072	348	45.0	1; 7.6	2,632

[19] Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo, D., Davies-Mostert, H.T. eds., 2016. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

Bat activity at Paulputs was very high in February whereas nationally and regionally, activity in February tended to be moderate. High activity was recorded at Paulputs in August and September whereas nationally and regionally activity tends to be low/moderate and moderate respectively. Comparatively lower activity was recorded at Paulputs in April, May, December and January compared to national and regional activity.

8.6.4 Discussion

The main findings of the bat monitoring are that approximately two thirds of the sample nights had low to moderate activity, activity was higher in summer and spring (accounting for ca. 40 % and 30 % of total activity respectively), and activity was dominated by the Egyptian free-tailed bat. Spatially, activity was lower activity at height compared to closer to ground level and bat activity was higher at PAU2.

The increased activity in summer and spring is expected based on better meteorological conditions (e.g. higher temperatures) compared to winter and autumn. These conditions promote insect activity which in turn provides better foraging conditions for bats. In addition, vegetation at the site, specifically the *Boscia foetida* subsp. *foetida* trees, were flowering in summer (and possibly in spring too) attracting many insects (pers. obvs.), increasing their suitability in acting as foraging focal points for bats and promoting higher activity. Bat activity occurred later into the night in summer and spring compared to winter and autumn, when bats appeared to restrict most of their activity to approximately three hours.

The higher activity around PAU2 is likely because of the better habitat at this location compared to the other bat detectors. There are a number of trees and shrubs at PAU2, and it is also located ca. 20 m from a wetland area. The trees can be used by some species as roosts, and the trees and water availability will also attract insects. This creates a more favourable foraging area for bats compared to the other detectors which have less diverse microhabitats. Therefore, avoiding areas with landscape features that are important for bats, must be used as an initial mitigation measure to design the layout of the facility in such a way to limit the potential for bats to encounter wind turbines during foraging and commuting. Searches for bats roosting in trees around PAU2, and other parts of the site, did not reveal any evidence of roosting bats.

8.7 Noise

The site falls entirely within the Bushmanland Arid Grassland vegetation type. The topography of the site is uniformly flat with small scattered rocky outcrops. The National Road N14 runs through the site from the southwest to the northeast. The predominant land use on the site is low intensity sheep grazing. A number of buildings are located sporadically around the Development, however the majority are not residential dwellings. Those properties which have been identified as residential dwellings are discussed in Section 3.2.

A desk-based search was carried out to identify potential noise-sensitive developments (principally houses) within 2 km of the Development, using National Geo-Spatial Information 1:50,000 scale digital mapping and Google Aerial imagery. All identified buildings were visited by the Arcus team to establish whether these were inhabited dwellings; a total of three occupied dwellings were identified within 2 km of the Development (marked as H1, H2 and H5 in Figure 1). One further dwelling was identified, but was unoccupied (marked as H3 of Figure 1). Notwithstanding this, it is understood that there remains the potential for this dwelling to become occupied at a later date, and has therefore been included as a noise-sensitive development as a conservative approach.

A number of other buildings were identified as part of the initial desk-based search, but the site visit confirmed these as not noise-sensitive, and have therefore been excluded from further consideration.

Noise-sensitive developments located more than 2 km of the proposed development have been excluded from investigation, on the basis that SANS 10328 requires assessment of those within 2 km.

8.8 Heritage, Archaeology and Palaeontology

8.8.1 Study Area Context

The study area is in a rural context with minimal historical development. Farms are very large and lack infrastructure with houses being widely spaced. The area is used primarily for small stock grazing, but several renewable energy facilities - all solar energy facilities - have recently been constructed in the area. This electrical infrastructure has resulted in a significant change to the character of the local landscape.

The WEF study area is flat and largely covered in sand and fine granitic gravel with sparse vegetation and scattered small rock outcrops.

Several archaeological sites have been found and excavated from Konkoonsies 91/6 some 15 km northwest of the centre of the present study area (Orton 2015a, 2016a). The sites were late Holocene sites that included mostly stone artefacts, ostrich eggshell and pottery but also occasional other finds such as bone, charcoal and a historical glass bead. Most were located around granite bedrock outcrops that had depressions or fissures that held water after rain and thus attracted settlement. The outcrops also had smooth, shallow depressions on them that are interpreted as grinding patches (Orton 2016a). These patches are a particular feature of Bushmanland and are frequently found in close proximity to any water source, no matter how temporary. They are assumed to have functioned as lower grindstones for the processing of food.

Other surveys recorded a number of Later Stone Age (LSA) scatters of ostrich eggshell and quartz artefacts some 4 km northeast of the present study area. They occurred in open areas as well as around the foot of small rocky koppies. Morris (2012) worked slightly further to the northeast and found ostrich eggshell fragments, a small quartz outcrop quarry and a scatter of Early (ESA) and Middle Stone Age (MSA) artefacts.

A survey of certain areas in and around the granite mountains and the larger koppies further to the northeast of the Paulputs substation yielded a variety of Stone Age sites. These included artefact scatters, sometimes with pottery, ostrich eggshell and bone and also granite bedrock outcrops with a number of grinding grooves. Historical sites were also found including some stone-packed graves and a stone-built animal trap ('tierhok').

More generally, it can be noted that archaeological sites in the area tend to be more commonly encountered around the fringes of granite hills, on sand dunes or around pans.

The study region was colonised quite late with most farms only surveyed and granted in the very late 19th or even early 20th centuries. As a result very few historical structures and features exist on the landscape. The majority of buildings date to the early-mid-20th century and tend to be of low or no heritage significance. A number of surveys in the Bushmanland area have recorded possible isolated graves represented by unusual rocks (either isolated standing rocks or unnatural clusters). These could be related to early '*trekboers'* passing through the area. Because they lived a very nomadic lifestyle, their physical traces are extremely ephemeral. The ruins of small stone structures that are occasionally found alongside rock outcrops in Bushmanland are likely to represent huts and small livestock enclosures built either by 19th century '*trekboers*' or by early 20th century shepherds.

8.8.2 Palaeontology

The general area is underlain by Precambrian basement rocks that are entirely unfossiliferous. They are intruded by small-scale, ring-shaped Jurassic dolerites that are of zero palaeontological sensitivity. There are late Caenozoic superficial deposits including alluvium, gravels and aeolian sands generally of low to very low palaeontological sensitivity. When they occur along water courses, the superficial deposits may contain very rare inclusions of isolated mammalian bones and teeth or freshwater molluscs which can be more significant. Organic-rich alluvial deposits can also contain pollens, spores and diatoms. On the study site there are feldspathic gravels ("Grus") derived from weathering of local granites of low palaeontological sensitivity.

Overall, Almond (2019) expects there to be no palaeontologically sensitive areas that would require further attention. No fossils were seen during the archaeological survey with all surface sediments tending to be granitic and hence not fossiliferous.

8.8.3 Archaeology

Archaeological resources were found to be thinly spread throughout the WEF study area. As expected, they were concentrated around landscape features such as rock outcrops and pans. Although water courses are known to have sites located along their margins, they are generally very rare in such contexts because the streams likely only flow for a few hours. Places that trap water were thus better suited to precolonial occupation.

The sites found during the present survey can be grouped into four types:

- Artefact scatters associated with or located on top of dolerite hills;
- Quartz outcrops exploited for stone for making stone tools;
- Bedrock outcrops that trap water and bear ground patches; and
- Artefact scatters associated with pans.

Artefact scatters were located on and around some, but not all, of the dolerite hills. Why there are no traces of precolonial use on the others is not known. A few small stone-walled structures were also found, including what is termed a windbreak, a semi-circular structure that may have functioned to protect people from wind or was perhaps used to hide behind while looking out for prey. This example had quartz artefacts and ostrich eggshell fragments associated with it. Several small circular structures were also noted. None had artefacts in them and they may have functioned as kraals in which lambs were placed overnight. Three examples of such features were all found near to each other at the foot of two hills in the north-western part of the WEF site.

Flaked quartz outcrops were seen in a few places. None of them were heavily flaked. The outcrops essentially functioned as large cores from which flakes were removed and taken away for further flaking or use.

Granite bedrock outcrops with grinding patches were only found in a limited part of the WEF study area in the northeast. A few smaller outcrops were seen but undoubtedly the most important archaeological site located during this survey was a very large granite outcrop bearing hundreds of grinding grooves. The outcrop also had many hollows in it that would trap water after rain. Artefacts in various materials, as well as some pottery, were noted around this large outcrop. Although the survey did not pay particular attention to this area, the limited coverage showed that people certainly did camp around the outcrop.

Three pans, all now excavated into small farm dams, were located and found to have archaeological material around them. The artefacts seem to be part of an elevated frequency of background scatter artefacts, no doubt related to people spending more time close to the pan. All the artefacts were of quartz. The third pan had an extensive artefact scatter associated with it, largely on its eastern side. The scatter included artefacts in a wide variety of materials.

8.8.4 Graves

No graves were seen in or near the study areas. It is still possible that unmarked graves are present but in this landscape where it is very difficult or impossible to excavate graves by hand the chances are extremely small.

8.8.5 Built Environment

Three farm complexes occur on the properties under study for the WEF but all fall just outside of the area under consideration for development. Another two farm complexes lie about 2.0 – 2.5 km from the proposed power line corridors and are not considered further. None of these houses would experience any direct impacts. Contextual impacts would occur, although buildings in this area tend to be no more than early-mid-20th century in age and are unlikely to be of much cultural significance.

8.8.6 Cultural Landscapes and Routes of Cultural Significance

The general area is very poorly developed from a cultural landscape point of view with only minimal human interventions into an otherwise natural landscape. The human interventions include farm complexes, fences, dams, wind pumps and livestock enclosures. All these elements tend to be very widely spaced on the landscape such that the overall historical human footprint is extremely light.

Stone Age material is very sparse and can be considered infrequent enough to make discussion of the precolonial cultural landscape not be worthwhile.

In contrast, a modern electrical layer is slowly being added. Thus far, it consists of three solar farms a large substation and several power lines. Another solar farm is currently under construction, while others are still undergoing investigation.

The N14 freeway which bisects the site from southwest to northeast can be considered a route of some cultural significance. This route passes through some quite spectacular semi-desert landscape and would be used by tourists travelling west towards Springbok during flower season and possibly also those travelling east towards Augrabies Falls. The Onseepkans Border Crossing into Namibia lies north of Pofadder, some 45 km from the study area. Although the western part of the site would be partially screened from the southwest, due to a range of hills, the generally flat landscape and the size of the turbines means that the proposed project would largely be openly visible. Significantly, the other electrical facilities in the local landscape are all located at some distance from the N14 and would not be visible from that road.

8.8.7 Site Sensitivity

The only heritage indicators of any concern are the archaeological resources that lie dotted across the landscape and the landscape itself through which N14 passes. While archaeological resources can and should be easily avoided, the landscape along the N14 will experience visual impacts as a result of the project. Maximising the distance between the N14 and the nearest turbines will reduce the impacts. The N14 can be considered to have medium cultural significance for the aesthetic and scenic qualities of the landscape through which it runs.

While isolated fossils may be present, the chances are very low. Structures greater than 60 years of age do occur in the landscape but there are very few and they are unlikely to be very much older than 60 years.

The archaeological resources are deemed to have medium cultural significance for their scientific value. The most important site can be considered as a Grade IIIA resource (the large granite outcrop), while the remainder are considered to be GP A or GP B.

Graves are deemed to have high cultural significance for their social value but none are yet known from the study area and the chances of graves being present are very small.

The buildings greater than 60 years old, although not physically examined, are likely to be of low cultural significance for their architectural and historical values.

8.8.8 Consideration of a 3 km buffer

During the scoping phase it was suggested that the developer could consider omission of the turbines from the south-eastern side of the N14 in order to reduce impacts to the landscape. In their response to the scoping report, SAHRA suggested that a minimum 3 km buffer along the N14 should be applied. A motivation to reduce the 3 km buffer was provided to and accepted by SAHRA. Nevertheless, further points in respect of this reduced buffer are provided here:

- While the N14 does have scenic value that is considered to have cultural significance, it is also notable that the route is very long and can be monotonous. Undoubtedly opinions on this will vary, but the important aspect is that similar views to those obtained in the study area can be seen both to the west and east. The N14 runs for about 55 km westwards before reaching the edge of the Springbok REDZ, while eastwards one has to travel about 116 km to reach the Upington REDZ;
- Even though the WEF would be visible from a long way off and local hills are all too small to provide screening, the visual impact is thus relatively brief because of the length of the N14;
- WEFs tend to present greater visual impacts to the landscape when the turbines compete with natural elements like tall mountains, and especially when they are viewed along the same skyline as the natural environment. In the present context the scale of the turbines is totally different to the natural landscape which would be viewed between the turbine towers and form a separate, lower skyline in the background; and
- The WEF is "contained" by the shape of the study area and is not spread out over long ridges. Concentration of impacts is important in reducing the significance because the extent is reduced. It is preferred to have the turbines closer to the road over a limited area than well spread out but further from the road.

8.9 Visual

8.9.1 Topography

The topography in the study area is characterised by flat, gently undulating plains interspersed with isolated hills and koppies. Areas of greater relief occur in the north-west of the study area where the Ysterberg and the Swartberg hills dominate the landscape. The flat terrain characteristic of the broader area results in generally wide-ranging vistas throughout the study area and the horizon is usually visible across an entire 360º arc of the viewer's vista. The view shed is only marginally constrained where isolated hills and koppies occur.

Wind turbines are very large structures with little to no topographic shielding and these will be visible from a very wide radius around the WEF application site. Although power lines are far less prominent structures than wind turbines, the pylons and the steel structures of the proposed substation are also likely to be visible from many of the locally-occurring receptor locations.

8.9.2 Vegetation

Vegetation cover across the study area is predominantly short and sparse and thus will not provide any visual screening. In some instances however, tall exotic trees planted around farmhouses may restrict views from receptor locations.

8.9.3 Land Use

According to the South African National Land Cover dataset (Geoterraimage 2014), large sections of the visual assessment area are characterised by low shrubland and areas classified as 'Bare (None Vegetated)'. While some of these 'bare' areas may be representative of transformation due to human activity, in most cases these patches of land are undisturbed areas with very sparse vegetation cover. Human influence is visible in the area in the form of the N14 national route which traverses the study area in a north-east to south-west direction. In addition, there are numerous small patches of land scattered across the study area which are classified as 'Mines / Quarries'. These areas appear to be small quarries or 'diggings' and are mostly located adjacent to the public roads, especially along the N14.

Sparse human habitation and the predominance of natural vegetation cover across much of the study area would give the viewer the general impression of a largely natural setting with some pastoral rural elements resulting from sheep rearing activities.

There are no towns or built-up areas in the study area influencing the overall visual character and thus there are very low levels of human transformation and visual degradation across much of the study area. There are however some significant anthropogenic elements in the study area, including an electrical substation (Paulputs), associated high voltage power lines and the recently constructed 100MW KaXu Solar One Concentrated Solar Power Plant (CSP), !Xina Solar One CSP and the 10MW Konkoonsies SEF with their associated infrastructure. In addition, it was noted during the field investigation that additional construction work, thought to be related to the proposed Konkoonsies II SEF is underway adjacent to the Konkoonsies SEF. This would suggest that further transformation of the landscape is taking place. Other, less prominent elements present in the area include telephone poles, windmills, gravel access roads and farm boundary fences. The presence of this infrastructure is an important factor in this context, as the introduction of the proposed WEF would result in less visual contrast where other anthropogenic elements are already present, especially where the scale of those elements is similar to that of the proposed development.

The presence of the KaXu, !Xina and Konkoonsies SEFs is a significant factor in the visual character of the study area. These types of facilities and their associated infrastructure are typically more industrial in character, significantly altering the visual character and baseline in the study area. In addition, the proposed Konkoonsies II SEF is underway adjacent to the Konkoonsies SEF. This would suggest that further transformation of the landscape is taking place.

8.9.4 Visual Character and Cultural Value

Visual character largely depends on the level of change or transformation from a natural baseline in which there is little evidence of human transformation of the landscape. Visual character is also influenced by the presence of built infrastructure such as buildings, roads and other objects such as telephone or electrical infrastructure.

The greater area surrounding the development site is an important component when assessing visual character. The area can be considered to be typical of a Karoo or "platteland" landscape that would characteristically be encountered across the high-lying dry western and central interior of South Africa. The Karoo is increasingly being marketed as an undisturbed getaway with the launching of tourism routes within the region.

The typical Karoo landscape can also be considered a valuable 'cultural landscape' in the South African context. Although the cultural landscape concept is relatively new, it is becoming an increasingly important concept in terms of the preservation and management of rural and urban settings across the world.

Cultural Landscapes can fall into three categories (according to the Committee's Operational Guidelines):

- "a landscape designed and created intentionally by man";
- an "organically evolved landscape" which may be a "relict (or fossil) landscape" or a "continuing landscape"; and
- an "associative cultural landscape" which may be valued because of the "religious, artistic or cultural associations of the natural element".

The typical Karoo landscape consisting of wide open plains, and isolated relief, interspersed with isolated farmsteads, windmills and stock holding pens, is an important part of the cultural matrix of the South African environment. The presence of small towns, such as Pofadder, engulfed by an otherwise rural, almost barren environment, form an integral part of the wider Karoo landscape. As such, the Karoo landscape as it exists today has value as a cultural landscape in the South African context. In terms of the types of cultural landscape listed above, the Karoo cultural landscape would fall into the second category, that of an organically evolved, "continuing" landscape.

In light of this, it is important to assess whether the introduction of a WEF with associated grid connection infrastructure into the study area would be a degrading factor in the context of the natural Karoo character of the landscape. However, considering the fact that a number of WEFs and SEFs have been developed or are likely to be developed across the Karoo, it is possible that renewable energy facilities and wind turbines may in the future become an integral part of the typical Karoo cultural landscape.

In this instance visual impacts on the cultural landscape would be reduced by the fact that the area is relatively remote and there are very few tourism or nature-based facilities in the study area. In addition, although the proposed development will be visible from the N14 national route, the section of this route that traverses the study area does not form part of a designated tourism route.

8.9.5 Visual Sensitivity

Visual sensitivity can be defined as the inherent sensitivity of an area to potential visual impacts associated with a proposed development. It is based on the physical characteristics of the area (i.e. topography, landform and land cover), the spatial distribution of potential receptors, and the likely value judgements of these receptors towards a new development. A viewer's perception is usually based on the perceived aesthetic appeal of an area and on the presence of economic activities (such as recreational tourism) which may be based on this aesthetic appeal.

In order to assess the visual sensitivity of the area, a matrix was used based on the characteristics of the receiving environment which indicate that visibility and aesthetics are likely to be 'key issues'.

Based on the criteria in the matrix, Table 8.4, the visual sensitivity of the area is broken up into a number of categories, as described below:

- **High** - The introduction of a new development such as a WEF would be likely to be perceived negatively by receptors in this area; it would be considered to be a visual intrusion and may elicit opposition from these receptors.

- **Moderate** – Receptors are present, but due to the nature of the existing visual character of the area and likely value judgements of receptors, there would be limited negative perception towards the new development as a source of visual impact.
- **Low** - The introduction of a new development would not be perceived to be negative, there would be little opposition or negative perception towards it.

Table 8.4 outlines the factors used to rate the visual sensitivity of the study area. The ratings are specific to the visual context of the receiving environment within the study area.

Table 8.4: Environmental factors used to define visual sensitivity of the study area

FACTORS	**RATING**									
	1	2	3	4	5	6	7	8	9	10
Pristine / natural character of the environment										
Presence of sensitive visual receptors										
Aesthetic sense of place / scenic visual character										
Value to individuals / society										
Irreplaceability / uniqueness / scarcity value										
Cultural or symbolic meaning										
Scenic resources present in the study area										
Protected / conservation areas in the study area										
Sites of special interest present in the study area										
Economic dependency on scenic quality										
Local jobs created by scenic quality of the area										
International status of the environment										
Provincial / regional status of the environment										
Local status of the environment										
**Scenic quality under threat / at risk of change										

**Any rating above '5' for this specific aspect will trigger the need to undertake an assessment of cumulative visual impacts.

Low					**Moderate**					**High**				
10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

Based on the above factors, the study area is rated as having a low to moderate visual sensitivity, mainly due to the natural character of the area. It should be stressed however that the concept of visual sensitivity has been utilised indicatively to provide a broad-scale indication of whether the landscape is likely to be sensitive to visual impacts, and is based on the physical characteristics of the study area, economic activities and land use that predominates. An important factor contributing to the visual sensitivity of an area is the presence, or absence of visual receptors that may value the aesthetic quality of the landscape and depend on it to produce revenue and create jobs.

No formal protected areas, leisure-based tourism activities or sensitive receptor locations were identified in the study area and relatively few potentially sensitive receptors were found to be present.

8.9.6 Visual Absorption Capacity

Visual absorption capacity is the ability of the landscape to absorb a new development without any significant change in the visual character and quality of the landscape. The level of absorption capacity is largely based on the physical characteristics of the landscape (topography and vegetation cover) and the level of transformation present in the landscape.

The relatively flat topography in the study area and the lack of vegetation to provide screening would reduce the visual absorption capacity across much of the area. This would be offset to some degree where the landscape has already undergone significant transformation as a result of the KaXu, !Xina and Konkoonies SEF developments in conjunction with the Paulputs substation and associated 132kV power lines, thus increasing the overall visual absorption capacity of the landscape.

Visual absorption capacity in the study area is therefore rated as moderate.

8.10 Social

8.10.1 Administrative and Regional Context

The proposed Paulputs WEF is located near the town of Pofadder, which is a very small town situated on the N14 national road from Upington to Springbok. The town of Pofadder is lies 50km from the Namibian border, and is more known as a stop-over town on-route to Springbok. The surrounding area is very arid and locals of Pofadder earn their income more from sheep and goat farming. The town is also considered as the service centre for the surrounding farm areas. Kakamas is also a town situated on the N14 national road on-route to Pofadder and is situated on the banks of the Orange River. For this reason this town earn their main income from farming practices like grapes and citrus farming. Due to this towns' close proximity to the Orange River, this town is also considered attractive for tourism activities in the area.

This WEF is located approximately 34km NE, outside the town of Pofadder. The proposed Paulputs WEF covers a proposed magnitude of approximately 10 000ha (75 WTG), covering 6 farms with four (4) proposed grid connections with a distance of approximately 23km from the switching stations to the existing Eskom Paulputs Substation (located NW of the proposed site).

The Paulputs WEF is located in the Northern Cape Province of South Africa. The Northern Cape Province is divided into five (5) district municipalities, i.e. Frances Baard, John Taolo Gaetsewe, Namakwa, Pixley ka Seme and the ZF Mgcawu (former Siyanda) District Municipality. The proposed Paulputs WEF is situated in two (2) district municipalities, i.e. the Namakwa District Municipality and the ZF Mgcawu District Municipality. The Namakwa District Municipality covers an area of approximately 126 836 km², which is further divided into seven (7) local municipalities, i.e. Nama Khoi, Hantam, Khâi-Ma, Kamiesberg, Karoo Hoogland, Richtersveld and Namaqualand.

The site of the proposed Paulputs WEF partially falls within the Khâi-Ma Local Municipality. The Khâi-Ma Local Municipality comprises of 16 628 km², and the administrative seat of the Khâi-Ma Local Municipality is located in the town of Pofadder. The Khâi-Ma Local Municipality consists of five (5) main towns namely, Aggeneys, Onseepkans, Pella, Pofadder and Witbank.

8.10.2 Demographic and Economic Context

In this section the demographic and economic context of the respective Province, District and Local municipalities is discussed. The information below was obtained from the Northern Cape Provincial Development and Resource Management Plan / Provincial Spatial

Development Framework (PSDF) of 2012 (Page 27 - 72), Namakwa District Municipality Integrated Development Plan 2018 / 2019 revision report, the Khai-Ma Local Municipality Final Integrated Development Plan for 2012 - 2017 (Review 2016 - 2017), the ZF Mgcawu District Municipality Draft Integrated Development Plan 2018 / 2019 for 2017 - 2022, and the Kai !Garib Local Municipality Draft Integrated Development Plan of 2018 / 2019. Where necessary the data was updated from the 2011 Census data with data from the Community Survey of 2016.

8.10.2.1 Northern Cape Province

The Northern Cape Province is located in the north western corner of South Africa. South Africa has nine provinces of which the Northern Cape is the largest. This province covers approximately 372 889 km², which is 30.5 % of the total land surface of the country. In terms of population, this province has the smallest population in the country, despite its size. According to the Northern Cape PSDF of 2012 the total population of the province in 2005 was estimated at 991 919 people with the major ethnic group being the black population, representing 46 % of the entire population. The 2016 Community Survey reported that the main ethnic population still remains the black population (48.1 %) followed by the coloured population (43.7 %) (Stats SA, 2018). According to the 2011 Census data the total population of the province was estimated at 1 145 861 people and it was estimated to grow to 1 185 600 people by the year 2015 (Stats SA, 2011). The Community Survey of 2016 however reports a 4.2 % growth in the population size of the province with a total population of 1 193 780 in 2016. The results further indicated that the Northern Cape Province is the province with the lowest percentage change in population size with a slight growth of 47 919 over a period of 6 years (Stats SA, 2018).

The 2011 Census data (Stats SA, 2011) revealed that the sex structure of the province was almost equal with approximately 51 % (512 126) of the total population being female and approximately 49 % (479 793) being male. The same trend can be viewed in the 2016 Community Survey with an equal distribution (50 % female and 50 % male). The 2016 Community Survey further reports that the population in the Northern Cape Province aged between 0 - 14 years dropped by 2.3 % from the 2011 Census data (30.1 % in 2011; 27.8 % in 2016). An increase from 34.8 % in 2011 to 36.5 % in 2016 for the population aged between 15 and 35 years was reported. The adult population aged between 35 and 64 years decreased from 29.4 % in the 2011 Census to 29.2 % in 2016, whereas the population of elderly persons grew from 5.7 % in the 2011 Census to 6.6 % in the 2016 Community Survey (Stats SA, 2018). The 2011 Census reported that the province has an average of 301 400 households with an average household size of 3.8 people. The 2016 Community Survey reported an increase in the number of households to 353 709, however the average household size have slightly declined to 3.4 people. In terms of access to services it was reported in the 2016 Community Survey that 88.5 % of the province's population has access to basic services like water, and 63.2 % have access to sanitation services (Stats SA, 2011; 2018).

The economy of the Northern Cape relies heavily on two sectors, namely the mining and agriculture sectors. These two sectors employ approximately 57 % of all employees in the province. Over the past eight years there has been little to no increase or decrease in the overall standard of living of the communities in the Northern Cape Province. According to the PSDF of 2012 this trend is unlikely to change in the foreseeable future, mainly due to the marginal economic base of the poorer areas, and the consolidation of the economic base in the relatively better-off areas of the province. The Northern Cape PSDF of 2012 reports that the percentage of the people living in the Northern Cape Province that live below the poverty line has decreased from 40 % in 1995 to 27 % in 2011, while the poverty gap has decreased from 11 % in 1995 to 8 % in 2011.

As reported by the Northern Cape Provincial Government, unemployment still remains a big challenge in the province. Unemployment was reported to be at 24.9 % during the fourth quarter of 2013. Unemployment also declined from 119 000 unemployed people in the fourth quarter of 2012 to 109 000 unemployed people in the fourth quarter of 2013. The PSDF further reports that the unemployment level in the province is lower than the national average, but that the "not economically-active" population is higher than the average for South Africa. According to the PSDF of 2012 the community and social services sector is the largest employer in the province at 29 %, followed by the agricultural sector (16 %), wholesale and retail trade (14 %), finance (8 %), manufacturing (6 %), and mining (6 %); where the mining sector is the largest contributor to the provincial Gross Domestic Product (GDP) at 26 %.

In terms of education the average adult education attainment levels in the province are lower than the adult education attainment levels of South Africa as a whole. Approximately 19.7 % of the Northern Cape adults have no schooling in comparison to South Africa's 18.1 %. The Northern Cape has the second lowest percentage of adult individuals (5.5 %) that obtained a tertiary education in South Africa (PSDF, 2012). The overall economic growth of the province has shown significant recovery since 2000 / 2001 when it had a negative economic growth rate of -1.5 %. However, the province is still the smallest contributing province to South Africa's economy (only 2 % to South Africa's GDP per region in 2007).

8.10.2.2 Namakwa District Municipality

The Namakwa District Municipality (NDM) is one of five district municipalities in the Northern Cape Province. The NDM comprises of seven local municipalities i.e. the Nama Khoi, Hantam, Khâi-Ma, Kamiesberg, Karoo Hoogland, Richtersveld and the Namaqualand Local Municipality. The NDM according to the 2011 Census is 126 836 km² in size, which is the largest district municipality in the Northern Cape. The administrative seat of the district municipality is located in the town of Springbok (Stats SA, 2011).

According to the 2011 Census the NDM has a population of 115 842 people. There has been a slight decline in the population of the local municipalities due to out-migration with an average population of 115 488 people according to the Community Survey in 2016. This district is the district with the lowest population compared to all the other district municipalities in the Province. The Community Survey of 2016 reveals that the majority of this population is made up of ages between 35 and 46 years (34.7 %), whereas 33.3 % are between the ages of 15 to 34 years, 22.5 % between the age of 0 to 14 years and 9.5 % above the age of 65. The gender distribution of the population is 50.55 % female and 49.45 % male according the 2011 Census data. The results from the Community Survey in 2016 further reveals that the majority (88.1 %) of the population comprises of a coloured population (Stats SA, 2011; 2018). The NDM IDP of 2018 - 2019 reported an improvement in the access to basic services like water, electricity and sanitation in the district. The report specifically mentions that "renewable energy is recently one of the cornerstones of the economy of the District and there needs to be engagement on National level to ensure that the District benefit from this resource" (NDM, 2018).

The IDP of the district reveals that the community services sector is the main sector that contributes to the district's economy, followed by the agricultural and mining sector. It further indicates that the district experienced a sharp decrease in GDP growth rated in 2009, which was attributed to the global economic downturn. However, the district forecast a positive GDP growth over the medium term. Between the years 2003 and 2013 the tertiary sector contributed most to the economy with an average annual contribution of 63.1 %. This data however is dated, and new data has not come to the forefront yet. The Northern Cape Province's labour market is faced with a high unemployment rate and the same scenario prevails in the Namakwa District. According to the NDM (2018) in 2014, 34 840 of the district's population were employed, with 9 515 people unemployed in the district, whereas 44 355 are economically active and 32 557 are not economically active. The IDP recognizes that employment in the district remains a challenge that needs to be addressed for economic development. The municipality had a poverty rate of 50.4 % in 2004 and 26.2 % in 2014 (NDM IDP, 2018). The IDP further stipulates that *"proper planning and implementation processes of programs that intend to create job opportunities need to be intensified"* to improve the labour market of the Namakwa District Municipality (NDM, 2018).

8.10.2.3 Khai-Ma Local Municipality

The Khâi-Ma Local Municipality (KLM) is located within the Namakwa District Municipality. This municipal area is approximately 16 628 km2 in geographical size. The KLM municipal area consists of five towns and their surrounding suburbs. These towns are Aggeneys, Onseepkans, Pella, Pofadder and Witbank. The administrative seat of the KLM is located in the town of Pofadder (Stats SA, 2011).

According to the 2011 Census the population of the KLM consist of 12 465 people. The Community Survey from 2016 reports a population size of 12 333 people in the KLM. Therefore, the population size had a negative growth rate of -0.2 % from the year 2011 to 2016. The racial makeup of the KLM reveals that the majority of the population is considered to be coloured (75.1 %), while 17.6 % are black and 6 % of the population white. Afrikaans and Tswana are the most spoken languages in this municipal area. The Community Survey of 2016 reports that the majority (40.9 %) of the KLMs population are aged between 15 and 34 years, followed by 30.7 % aged between 35 and 64, 22.2 % aged between 0 and 14 years and 6.2 % aged above 65 (Stats SA, 2018). The Census data from 2011 indicated that the KLM comprised of 3 783 households with a household size of an average of 3.3 people (Stats SA, 2011). Although the population size have showed a slight decrease in the 2016 Community Survey, the survey in 2016 reflects a growth in the number of households to 4 079 with a household size of 3 people per household. The survey further revealed that the KLM is the local municipality within its district which reported to have the most access to basic municipal services (Stats SA, 2018).

The Census data from 2011 reveals that from the 5 904 people in the KLM that are economically active, 22.1 % are unemployed. The data further reveals that 322 are classified as "discouraged work-seekers" (Stats SA, 2011). According to the KLM IDP of 2012 - 2017 the poverty levels of the KLM are high (KLM, 2012). The reasons ascribed to this is the high levels of unemployment in the local municipality and an increase in the prevalence of illnesses like HIV/AIDS and TB. The IDP further states that communal farming on peri-urban land causes environmental challenges. HIV/AIDS levels are considered high, especially along the national transport routes. The IDP states that there is an out-migration of skilled people, due to a lack of local economic opportunities in the KLM; the increasing temperatures in the area may lead to an increase in the unemployment rate; and the socio-economic conditions of the KLM are poor which in turn can have a negative effect on the sustainability of infrastructure and service delivery in the KLM. Despite the poor figures reported above, the KLM in its IDP reported that one of their main objectives remain Local Economic Development. For this the KLM set forth a local economic development plan in the IDP to strategize on how to create employment opportunities in the KLM, to alleviate poverty, and to redistribute resources and opportunities for the benefits of the people in the KLM (KLM, 2012).

8.10.2.4 ZF Mgcawu District Municipality

The ZF Mgcawu District Municipality (ZDM) forms the mid-northern section of the province on the frontier with Botswana. This district borders with four district municipalities, namely the John Taolo Gaetsewe, Francis Baard, Pixley ka Seme and the Namakwa District Municipality. It also borders with the Republic of Botswana and Namibia. The ZF Mgcawu

District comprises of six Local Municipalities i.e. the Mier, Kai! Garib, Kara Hails, Tsantsabane, Kheis and the Kgatelopele Local Municipality.

According to the 2011 Census data this district is 102 524 km2 in size with a total population of 236 783 people. The ZF Mgcawu IDP of 2018 / 2019 recorded an increase of 35 903 people that represents a 17.8 % increase in the overall population of the district. The aforementioned IDP also indicates that the majority of the population is located in the //Khara Hais Municipality (42%), followed by the Kai! Garib Municipality (24%) and the Tsantsabane Municipality (12%). According to Stats SA (2011) it is reported that 51.21 % of the population in the ZDM is female, while 48.79 % are male. The highest population of the ZDM is within the ages of 1 - 19 years. These figures are however dated and should be carefully taking into consideration. It is further reported by Stats SA (2018) that 60.4 % of the population are coloured in race, while 29.4 % are black african and 8.2 % white. The most spoken language in this area is Afrikaans and Tswana.

The ZDM (2018) IDP for 2017 - 2022, reports that the degree of economic concentration in South African urban areas is significant; the South African Cities Network indicates that 21 functional urban areas (which exclude Upington, but include Kimberley), covering 2 % of the national surface area, generate nearly 70 % of the Geographic Value Added (GVA). In the 1990s the area between Tshwane and Johannesburg generated 24 % of the GDP growth; on 0.2 % of the national footprint. There is a very real risk that the economies of agglomeration driving the trend of spatial concentration can result in many cities, towns and rural regions that used to be thriving centers of commerce becoming economically marginalized and dependent on state handouts for survival.

The IDP further identifies that its key economic activities are: agriculture, agricultural enterprises, livestock farming, irrigation farming, tourism and heritage, and minerals and mining. In terms of the minerals and mining in the ZDM, the municipality accounts for approximately 30 % of the province’s economy. The tourism sector however, is regarded as the most important sector in the ZDM, besides mining. According to the IDP it is regarded as the fastest growing industry that contributes to the economy of the ZDM. The real area for potential economic growth lies within tourism development. The mining and agricultural sectors thus largely dominate the economy of the ZDM.

8.10.2.5 Kai !Garib Local Municipality

The Kai !Garib Local Municipality (KGLM) is situated along the Orange River and covers an area of approximately 26 358 km^2 in size. The KGLM according to the IDP of KGLM (2018) falls within the ZF Mgcawu District Municipality and consists of three large towns: Kakamas, Keimoes and Kenhardt. The Census 2011 data reports that the total population of the KGLM is 65 869 people, of which 62.2 % are coloured, 28.3 % are black african and 6.3 % are white. The Community Survey of 2016 reported a 1 % increase in the population size of the KGLM from 2011 to 2016 with a population size of 68 929 in 2016 (Stats SA, 2018). Stats SA (2018) indicate that 44.3 % of the total population of the KGLM are between the ages of 15 and 34 years, followed by 28.1 % being between 35 and 64 years, 22.7 % between 0 and 14 years, and only 4.8 % above the age of 65. It is further reported by Stats SA (2011) that 34.6 % of the households in this local municipality are female headed households.

The number of households in this area are 16 703, whereas 2 076 are considered agricultural households. The average household size is 3.9 people per household. The household size from Census 2011 to the Community Survey in 2016 revealed an increase in the number of households to 23 017 households in the KGLM. The household size however decreased to 3 people per household (Stats SA, 2018). The Census 2011 data further reports that 30 949 people in the KGLM are economically active, of which 10 % are unemployed (Stats SA, 2011). The KGLM (2018) reports that the economy of the KGLM is heavily dependent on the agricultural sector. The main national roads running through this local municipal area assists in the economic growth of the KGLM. The IDP (KGLM, 2018) further reports that 49 % of the agricultural sector contributes to the employment sector in the KGLM, making it the biggest contributor to the employment sector. This is followed by the government as an employer (17 %), the household sector (14 %), finance (8 %) and trading (7 %) sectors.

8.11 Traffic and Transportation

The various roads along the N7 are all two-way single carriageways, with varying posted speeds and shoulder widths.

Shoulder width varies on road sections along the route and sections of the N7 have passing lanes (i.e. in Piekenierskloof Pass). The N7 mountainous sections through Piekenierskloof Pass requires special attention for particularly long super-load vehicles.

Two-way traffic flow service level (at Level of Service E) are some 2500 passenger car vehicles per hour (pcvph) on the 120 km/h rolling terrain sections of the N7, 1410 pcvph on the 80 km/h two-lane mountainous sections of the N7 (i.e. Piekenierskloof Pass near Citrusdal), and 2500 pcvph on rolling sections on other regional routes.

During the site visit on 24 August 2018, a normal traffic day, it was observed that the above roads have sufficient spare capacity to accommodate the proposed development traffic, as well as expected traffic from other similar (wind/solar) energy projects in the Paulputs area.

This is also apparent from the N7 traffic count data in year 2017 which shows the N7 operating well below capacity. Extracts of Traffic Count Data shows highest road volumes recorded (TS1 northbound and TS2 southbound) on various sections of the N7. The highest road traffic volume was 743 pcvph, which is far below capacity of 2500 vph on rolling road sections and 1410 vph on mountainous road sections.

During the site visit it was also observed that the N14 carries lower traffic volumes than the N7 and has abundant spare capacity. There are no traffic counts available for the N14 in the vicinity of the site but the traffic counts on the N14, between Springbok and Pofadder relatively close to the site are shown below.

Traffic volumes on the N14 in the vicinity of the site should be similar to the above counts. (i.e. 317 vph (counted in year 2013). Allowing a very high 5% compound annual traffic growth, the traffic flow would increase to a modest 425 vph, which is far below the N14 road capacity of 2500 vph.

By observation, the Regional routes carry substantially lower traffic volumes and have ample spare capacity to accommodate proposed development traffic, as well as expected traffic from other similar (wind and solar) energy projects in the Paulputs area. No traffic counts are available on these routes.

The new Road over River bridge construction on the N7 south of Klawer is a present constraint on the N7 route for super-load vehicles in particular. This project is nearing completion and will be completed well ahead of the Paulputs WEF Project.

The new interchange on the R27 (planned to provide east-west access to the R45) is however at an early stage of construction. The interchange could impact on this project, and could require a temporary bypass lane or an alternate route from Saldanha Port to the N7.

The Paulputs WEF will require an extensive on-site road network to facilitate access to the wind turbine sites.

9 WIND ENERGY RELATED IMPACTS

In this section, the typical issues / impacts related to the establishment of a WEF and associated infrastructure (such as on-site substations and power lines) are discussed. It is important to note that over the next few years several WEFs (including substations and power lines) are likely to be constructed in South Africa. The development and associated environmental assessment of WEFs in South Africa is relatively new, and thus it is valuable to draw on international experience. This section of the report therefore draws on international scientific literature and web material (of which there is significant material available) to describe the generic impacts associated with WEFs and associated infrastructure such as on-site substations and power lines. It should thus be noted that this section is not entirely specific to the site.

9.1 Health Related Impacts

The potential health impacts typically associated with WEFs include, noise, dust, shadow flicker and electromagnetic radiation. 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). In South Africa this positive impact on health is largely due to improved air quality.

The overall conclusion of the review undertaken by the Australian Health and Medical Research Council (July, 2010) is that, based on current evidence, wind turbines do not pose a threat to health if planning guidelines are followed.

9.2 Generic Visual Impacts Associated with Wind Farms

Internationally, studies have demonstrated that there is a direct correlation between the number of turbines and the degree of objection to a wind farm, with less opposition being encountered when fewer turbines are proposed. Certain objectors to wind farms also mention the "sky space" occupied by the rotors of a turbine, this refers to the area in which the rotors would rotate. The visual prominence of the development would be exacerbated within natural settings, in areas of flat terrain or if located on ridge tops.

Shadow flicker

Shadow flicker is an effect which is caused when shadows repeatedly pass over the same point. The effect of shadow flicker is only likely to be experienced by people situated directly within the shadow cast by the blade of the wind turbine. Shadow flicker may also be experienced by motorists if a wind turbine is located in close proximity to an existing road. The impact of shadow flicker can be effectively mitigated by choosing the correct site and layout for the wind turbines, taking the orientation of the turbines relative to the nearby houses and the latitude of the site into consideration.

A visibility analysis, based on a worst case scenario structure height of 230 m (blade tip height), showed that the Paulputs WEF site would be visible from all identified potentially sensitive receptors and as such, no areas on the site were significantly more sensitive than the remainder of the site. The main concern from a visual perspective is therefore the direct visual impact of the turbines on any farmsteads or receptors located on the application site. Accordingly, visual sensitivity is restricted to a 500 m exclusion zone on either side of the N14 receptor road and also around the two receptor locations which lie within 500 m of the site boundary. The preclusion of turbine development from this zone would reduce the direct impact of the turbines on the occupants of the farmstead, especially those impacts related to shadow flicker.

Motion-based visual intrusion

Motion-based visual intrusion refers to the inclination of the viewer to focus on discordant, moving features when scanning the landscape, however it is not necessarily perceived negatively. It may even be possible that wind farms will, through time, form part of the cultural landscape of an area, and become a representation of the opportunities presented by the natural environment.

Wind Farm Electrical Infrastructure

Electrical infrastructure will include:

- A new on-site 132kV substation.
- Medium voltage cabling connecting the turbines to the on-site substation.
- A 132kV overhead power line from the on-site substation to the Paulputs substation or to the existing 132kV power lines which traverse the area.

Power line towers and substations are by their nature very large objects and thus highly visible. Elements of grid connection infrastructure could be perceived to be highly incongruous in the context of a largely natural landscape. The height and linear nature of the power line will exacerbate this incongruity, as the towers may impinge on views within the landscape.

In this instance, the proposed grid connection infrastructure is intended to serve the proposed Paulputs WEF and as such, will only be built if the WEF project goes ahead. The power line and substation infrastructure are therefore likely to be perceived as part of the greater WEF development and the visual impact will be relatively minor when compared to the visual impact associated with WEF as a whole.

Other WEF Infrastructure

The other infrastructure associated with the proposed Paulputs WEF will include the following:

- Internal roads between 6 m and 12 m;
- Hardstand areas at the base of each turbine to accommodate the turbine base and crane pad.
- A permanent laydown area and a temporary construction laydown.
- Operations and maintenance (O&M) buildings
- Security lighting.

Surface clearance for access roads, hardstand areas and laydown areas may result in the increased visual prominence of these features, thus increasing the level of contrast with the surrounding landscape. Buildings placed in prominent positions such as on ridge tops may also break the natural skyline, drawing the attention of the viewer. In addition, security lighting on the site may impact on the nightscape.

The visual impact of infrastructure associated with a WEF is generally not regarded as a significant factor when compared to the visual impact associated with wind turbines. The infrastructure would however increase the visual "clutter" of the WEF and magnify the visual prominence of the development if located on ridge tops or flat sites in natural settings where there is limited tall wooded vegetation to conceal the impact.

9.3 Impacts on Tourism

The proposed Paulputs WEF is situated in the Northern Cape Province, within two local municipalities. The two towns in close proximity to the site are the town of Pofadder and Kakamas. The main tourism in this area is linked to the areas' natural resources, undisturbed scenery and landscape. The town of Pofadder is considered as a stop over town for tourist to the West Coast of South Africa and Namibia, whereas the town of Kakamas is very famous for it is situated on the banks of the Orange River and the Augrabies Water Falls. Both towns are therefore considered as popular destinations for tourism purposes. The impact however of the proposed Paulputs WEF and its proximity to these towns on the tourism sector is likely to be low, but in some cases the WEF may attract tourists to the proposed area and its surroundings.

9.4 Impacts on Property Values

The potential social impact associated with the establishment of the proposed Paulputs WEF will have a visual impact on the environment and its surroundings. In effect this will also impact the sense of place or character of the surrounding areas. The proposed Paulputs WEF will be visible from the N14 national road, and the impact hereof on the sense of place is likely to be high. In addition the grid connection lines to the Paulputs Substation is also linked to the visual impact and the areas sense of place. The potential impact of property values associated with the operational phase of the Paulputs WEF is however likely to be low due to the isolation of the site in the area.

10 ASSESSMENT OF POTENTIAL IMPACTS FOR THE WEF AND GRID CONNECTION

10.1 Geology, Soils and Agriculture

The components of the project that can impact on soils, agricultural resources and productivity are:

- Occupation of the land by the total, direct, physical footprint of the proposed project including all roads.
- Construction activities that may disturb the soil profile and vegetation, for example for levelling, excavations, etc.

The significance of all potential agricultural impacts is kept low by two important factors:

- The actual footprint of disturbance of the wind farm (including associated infrastructure and roads) is very small (approximately 2 %) in relation to the surface area of the affected farms. All agricultural activities will be able to continue unaffectedly on all parts of the farms other than the small development footprint for the duration of and after the project.
- Electricity grid infrastructure has negligible impact on agriculture after construction because all viable agricultural activities in the project area (only grazing) can continue, undisturbed below power lines.
- The proposed site is on land of extremely limited agricultural potential that is only viable for low intensity grazing. Grazing can continue in tandem with the wind farm and grid connections.

Three potential agricultural impacts have been identified. Two of these are direct, negative impacts and apply to all three phases of the development (construction, operational and decommissioning). The third impact is a positive, indirect impact and only applies to the operational phase. The impacts are assessed in table format below.

10.1.1 Construction / Operation / Decommissioning

Impact Phase: Construction/ Operation/ Decommissioning
Potential impact description: Loss of agricultural land use Agricultural grazing land directly occupied by the development infrastructure, which includes roads and hardstands, will become unavailable for agricultural use. However, only a very small proportion of the total land surface is impacted in this way.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	M	L	Negative	L	L	H
With Mitigation	L	M	L	Negative	L	L	H
Can the impact be reversed?			Yes, once the wind farm is decommissioned, the footprint of the infrastructure can again be utilised as grazing land.				
Will impact cause irreplaceable loss or resources?			No, because only a very small amount of grazing land is lost and such land is not a scarce resource.				
Can impact be avoided, managed or mitigated?			No				
Mitigation measures to reduce residual risk or enhance opportunities: - None							

The intensity is considered low because of the very small amount of land and because of its low agricultural potential only as grazing land. The extent is low because the impact is limited to within the project area and only to parts of it (the direct footprint). The duration is medium because the impact lasts for the life of the project.

Impact Phase: Construction/ Operation/ Decommissioning							
Potential impact description: Soil degradation Soil degradation can result from erosion and topsoil loss. Erosion can occur as a result of the alteration of the land surface run-off characteristics, which can be caused by construction related land surface disturbance, vegetation removal, and the establishment of hard surface areas including roads. Loss of topsoil can result from poor topsoil management during construction related soil profile disturbance. Soil degradation will reduce the ability of the soil to support vegetation growth.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	M	M	Negative	M	M	H
With Mitigation	L	M	L	Negative	L	L	H
Can the impact be reversed?			Soil degradation can be reversed only to some extent and only with substantial inputs over a significant period of time.				
Will impact cause irreplaceable loss or resources?			No, because only a very small amount of grazing land is lost and such land is not a scarce resource.				
Can impact be avoided, managed or mitigated?			Yes, see below				
Mitigation measures to reduce residual risk or enhance opportunities: - Implement an effective system of storm water run-off control using bunds and ditches, where it is required that is at all points of disturbance where water accumulation might occur. The system must effectively collect and safely disseminate any run-off water from all hardened surfaces and it must prevent any potential down slope erosion. - Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize disturbed soil against erosion. - If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.							

The intensity is considered medium without mitigation because unchecked erosion would cause a partial loss of land capability. With effective mitigation, degradation can be prevented and the intensity is therefore considered low. The extent is low because the impact is limited to within the project area and only to a small proportion of it. The duration is medium because the impact lasts for the life of the project.

Impact Phase: Operation							
Potential impact description: Generation of additional land use income Income will be generated by the farming enterprises through the lease of the land to the energy facility. This will provide the farming enterprises with increased cash flow and rural livelihood, and thereby improve their financial sustainability.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	M	L	Positive	M	H	H
With Mitigation	L	M	L	Positive	M	H	H
Can the impact be reversed?			Yes, it is reversed as soon as income generation ceases at the end of the project.				
Will impact cause irreplaceable loss or resources?			No				
Can impact be avoided, managed or mitigated?			No				
Mitigation measures to reduce residual risk or enhance opportunities: - None							

The intensity is considered low because the increased income is only likely to affect a minor improvement to farming on the land. The extent is low because the impact is limited to within the project area. The duration is medium because the impact lasts for the life of the project.

The significance of all potential agricultural impacts is kept low by two important factors.

Firstly, the actual footprint of disturbance of the wind farm (including associated infrastructure and roads) is very small in relation to the available grazing land on the effected farm portions (a maximum of approximately 5% of the surface area). All agricultural activities will be able to continue unaffectedly on all parts of the farm other than the small development footprint for the duration of and after the project. Secondly, the proposed site is on land of very limited agricultural potential that is only viable for low density grazing. These two factors also mean that cumulative regional effects as a result of other surrounding developments, also have low significance.

10.2 Freshwater and Wetlands

During the impact assessment undertaken as part of this EIA phase a number of potential key issues / impacts were identified and these were assessed based on the methodology supplied by Arcus.

- Impact 1: Loss of riparian systems and disturbance of the alluvial watercourses in the construction and decommissioning phases
- Impact 2: Impact on riparian systems through the possible increase in surface water runoff on riparian form and function during the operational phase
- Impact 3: Increase in sedimentation and erosion in the construction, operational and decommissioning phases
- Impact 4: Potential impact on localised surface water quality during the construction and decommissioning phases
- Impact 5: The No-go Alternative
- Impact 6: Cumulative impacts for the overall project due to the high number of projects surrounding this application

10.2.1 Construction / Operation / Decommissioning

Impact Phase: Construction / Operation / Decommissioning							
Potential impact description: Impact 1 - Loss of riparian systems and disturbance of the alluvial watercourses in the construction, operational and decommissioning phases Should any of the proposed structures (turbines, roads, buildings and or transmission lines) be placed within the delineated watercourse, a physical loss of associated vegetation as well damage to the bed and banks of the observed systems could occur. Although true aquatic obligate vegetation was seen, any disturbance of these areas could result in disturbance of the systems resulting in erosion / sedimentation, loss of habitat and corridor (Ecological Support Area) fragmentation. These disturbances will be the greatest during the construction and again in the decommissioning phases as the related disturbances could result in loss and/or damaged vegetation, while to a lesser degree in the operation phase (i.e. as and when maintenance of roads occur).							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	M	Negative	M	M	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?			Yes – through removal of hard surfaces and careful reinstatement of natural ground levels coupled to revegetation				
Will impact cause irreplaceable loss or resources?			No – significant water courses remain within the greater catchment				
Can impact be avoided, managed or mitigated?			Yes – refer to mitigations below				
Mitigation measures to reduce residual risk or enhance opportunities: - Where new 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 (reduce footprint as much as possible). - During the construction and operational /decommissioning phase, monitor culverts to see if erosion issues arise and if any erosion control is required. - Where possible culvert bases must be placed as close as possible with natural levels in mind so that these don't from additional steps / barriers. - Vegetation clearing should occur in in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment. - It is also advised that an Environmental Control Officer (ECO), with a good understanding of the local flora be appointed during the construction phase. The ECO should be able to make clear recommendations with regards to the re-vegetation of the newly completed / disturbed areas within aquatic environment, using selected species detailed in the aquatic assessment report. - All alien plant re-growth must be monitored, and should it occur these plants should be eradicated. The scale of the operation does however not warrant the use of a Landscape Architect and / or Landscape Contractor.							

Impact Phase: Operation / Decommissioning
Potential impact description: Impact 2 - Impact on riparian systems through the possible increase in surface water runoff on downstream riparian form and function, due to impacts to the hydrological regime such as alteration of surface run-off patterns This could occur within the operational and decommissioning phase when any of the hard or compacted surfaces (roads or hard stand areas) increase the volume and velocity of the surface runoff. This could impact the hydrological regime through the increase in flows that are concentrated in an area, and as most plants are drought tolerant an increase in water will allow for other species to develop and outcompete typical plant species found within the region. This then affects the structure (i.e. larger taller grasses / shrubs / trees) and function (greater attenuation of flows, restricting any runoff from reaching downstream areas). The opposite can also happen. If flows are too concentrated with high velocities, scour and erosion results, with a complete reduction or disturbance of riparian habitat.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	M	M	Negative	M	M	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?		Yes – through removal of hard surfaces and careful reinstatement of natural ground levels coupled to revegetation					
Will impact cause irreplaceable loss or resources?		No – significant water courses remain within the greater catchment					
Can impact be avoided, managed or mitigated?		Yes – refer to mitigations below					
Mitigation measures to reduce residual risk or enhance opportunities: - Vegetation clearing should occur in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment. - Any storm-water within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities - No stormwater runoff must be allowed to discharge directly into any water course along roads, and flows should thus be allowed to dissipate over a broad area covered by natural vegetation. - Stormwater from hard stand areas, buildings and substation must be managed using appropriate channels and swales when located within steep areas or have steep embankments							

Impact Phase: Construction / Operation / Decommissioning							
Potential impact description: Impact 3 - Increase in sedimentation and erosion within the development footprint Impacts include changes to the hydrological regime such as alteration of surface run-off patterns, runoff velocities and or volumes which could occur during the construction, operational and decommissioning phases							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	M	Negative	M	M	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?		Yes – through removal of hard surfaces and careful reinstatement of natural ground levels coupled to revegetation					
Will impact cause irreplaceable loss or resources?		No – significant water courses remain within the greater catchment					
Can impact be avoided, managed or mitigated?		Yes – refer to mitigations below					
Mitigation measures to reduce residual risk or enhance opportunities: - Any storm-water within the site must be handled in a suitable manner, i.e. trap sediments and reduce flow velocities. Any management actions must be dealt with in the Stormwater Management Plan (SWMP) typically submitted post EA, forming part of the WULA.							
Impact to be addressed/ further investigated and assessed in Impact Assessment Phase?			Yes – once final road layout in known which would indicate the potential number of water course crossings				

Impact Phase: Construction / Operation / Decommissioning
Potential impact description: Impact 4 – Impact on localized surface water quality During construction / decommissioning 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.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	M	M	Negative	M	L	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?		Yes - through typical measures associated with the cleanup of spills					
Will impact cause irreplaceable loss or resources?		No – due to limited flows within these systems					
Can impact be avoided, managed or mitigated?		Yes – refer to mitigations below					

Mitigation measures to reduce residual risk or enhance opportunities:

- Strict use and management of all hazardous materials used on site in line with the specific material safety data sheets, e.g. fuels must be stored within a contained / bunded site with the necessary and spill kits available.
- 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.
- Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility.
- Strict control over the behaviour of construction workers, with regard littering, use and storage of chemicals.
- Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Environmental Management Plan (EMP) for the project and strictly enforced.

10.3 Flora and Terrestrial Fauna

Impacts associated with the Wind Farm and Grid Connection of the development are assessed below for the Construction, Operational and Decommissioning phases.

10.3.1 Construction Impacts

Impact Phase: Construction

Potential impact description: Impacts on vegetation and plant species of conservation concern

Several protected species occur at the site which may be impacted by the development and grid connection component, most notably *Hoodia gordonii*, *Aloidendron dichotomum* and *Boscia foetida*. The abundance of these species in the development footprint is however low and it is likely that most individuals can be avoided with the result that it would not compromise the viability of the local populations of these species. Apart from the potential impact on protected species, there would be a more general loss of intact vegetation within the development footprint. Although the development would have some local impact on the availability of the affected habitat type, the Bushmanland Arid Grassland is a very extensive vegetation type and the loss of the vegetation within the development footprint is not considered to have broader significance.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
WEF							
Without Mitigation	M	H	H	Negative	M	H	H
With Mitigation	M	H	M	Negative	M	H	H
Grid Connection							
Without Mitigation	L	H	M	Negative	M	H	H
With Mitigation	L	H	L	Negative	L	H	H

Can the impact be reversed?	No, this is an inevitable outcome of the development that cannot be avoided
Will impact cause irreplaceable loss or resources?	No, there are no species of high conservation concern at the site and the affected habitats are widespread and not of high concern.
Can impact be avoided, managed or mitigated?	No, habitat loss associated with the development cannot be avoided, but it can be reduced to some extent and restricted to the less sensitive parts of the site.

Mitigation measures to reduce residual risk or enhance opportunities:

- No development of infrastructure within identified High sensitivity areas.
- Pre-construction walk-through of the development footprint to locate and identify protected species within the development footprint. All relevant clearing or translocation permits must be obtained before construction starts.
- Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc.
- Environmental Control Officer (ECO) to provide supervision and oversight of vegetation clearing activities.
- All cleared areas that are not under hard infrastructure will need to be rehabilitated with locally occurring species.
- 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.

Impact Phase: Construction

Potential impact description: Direct and indirect faunal impacts

The construction of the development will result in habitat loss, noise and disturbance on site. This will lead to direct and indirect disturbance of resident fauna. Some slow-moving or retiring species such as many reptiles would likely not be able to escape the construction machinery and would be killed. There are also several species present at the site which are vulnerable to poaching and there is a risk that these species may be targeted. This impact would be caused by the presence and operation of construction machinery and personnel on the site. This impact would however be transient and restricted to the construction phase, with significantly lower levels of disturbance during the operational phase, although turbine noise is likely to have some impact on some species sensitive to ambient noise levels.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
WEF							
Without Mitigation	L	L	M	Negative	M	H	H
With Mitigation	L	L	M	Negative	M	H	H
Grid Connection							
Without Mitigation	L	L	M	Negative	M	H	H
With Mitigation	L	L	L	Negative	L	M	H

Can the impact be reversed?	Yes. Construction phase disturbance will be transient and associated with the construction phase only although habitat loss will last for the duration of the operational phase.
Will impact cause irreplaceable loss or resources?	No. No species of high conservation concern are likely to be compromised by the development.
Can impact be avoided, managed or mitigated?	Partly. While there is some scope for avoidance of sensitive habitats, some disturbance and habitat loss is an inevitable consequence of development that cannot be avoided.

Mitigation measures to reduce residual risk or enhance opportunities:

- Avoidance of / Minimise the development footprint within identified areas of high fauna importance such as rocky outcrops, drainage lines and dunes. - Search and rescue for reptiles and other vulnerable species during construction, before areas are cleared. - 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 electrical cabling or other purpose, 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. - Limit access to the site and ensure that construction staff and machinery remain within the demarcated construction areas during the construction phase. - Environmental induction for all staff and contractors on-site.

10.3.2 Operational Impacts

Impact Phase: Operation							
Potential impact description: Direct and indirect faunal impacts Operational activities as well as the presence of the turbines and the noise they generate may deter some sensitive fauna from the area. Species which rely on hearing for predator avoidance or communication may be particularly susceptible although most animals are able to make some behavioral adjustments to compensate for increased background noise levels. This is a low-level continuous impact which could have significant cumulative impact on sensitive species.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
WEF							
Without Mitigation	L	H	M	Negative	M	M	H
With Mitigation	L	H	L	Negative	L	M	H
Can the impact be reversed?		No. Habitat loss and disturbance will persist for the lifetime of the facility. The habitat could be partly restored thereafter.					
Will impact cause irreplaceable loss or resources?		No. No species of high conservation concern are likely to be compromised by the development.					
Can impact be avoided, managed or mitigated?		No. The impacts results from the presence and operation of the facility and as such cannot be avoided.					
Mitigation measures to reduce residual risk or enhance opportunities: - Open space management plan for the development, which makes provision for favourable management of the facility and the surrounding area for fauna. - Appropriate design of roads and other infrastructure where appropriate to minimise faunal impacts and allow fauna to pass through or underneath these features. - No electrical fencing within 20cm of the ground as tortoises become stuck against such fences and are electrocuted to death. - Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location. - If any parts of 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) as far as possible, which do not attract insects. - All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises.							

Impact Phase: Operation
Potential impact description: Impact on CBAs and future conservation options The development is partly located within an area that is a recognised area of biodiversity significance and has been classified as a Tier 1 CBA. The CBA has been delineated based on the presence of *Aloidendron dichotomum*, which is confirmed present at the site at low density both within and outside of the area

demarcated as CBA. Under the current layout, the development will result in direct habitat loss equivalent to about 15 ha within the CBA as well as potentially affect specific features of conservation concern within the CBA. The impact on the CBA would result from the transformation of currently intact habitat and potentially the presence and operation of the facility. While the development of renewable energy projects around the Paulputs substation would reduce the conservation value of the area, it has not been identified as an area for conservation expansion under the national or provincial Protected Area Expansion Strategy and there are no features present in the immediate area that are not widely available elsewhere. As such, development in the CBA is considered acceptable provided that the potential impacts on *Aloidendron dichotomum* can be effectively mitigated. The grid connection linking the different substation options traverses the CBA 1 on the site for a short distance, while the Option A and Option B grid connection to Paulputs traverse an extensive tract of CBA 2. This would result in some habitat loss as well as potentially affect specific features of conservation concern within the CBAs. The total footprint in these areas would however be low.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	H	M	Negative	M	M	H
With Mitigation	L	H	L	Negative	L	M	H

Can the impact be reversed?	No. Habitat loss and disturbance will persist for the lifetime of the facility. The habitat could be partly restored thereafter.
Will impact cause irreplaceable loss or resources?	Potentially for the WEF as it is not clear why the CBA 1 has been designated and depending on the nature of the features of concern present, irreplaceable loss could occur if these were significantly impacted. No for the grid connection as the power line would not generate significant footprint within the CBA, so as to compromise the functioning of the CBA.
Can impact be avoided, managed or mitigated?	Yes, potentially, the feature of concern could be verified in the field and mapped at a higher resolution and avoided as necessary and features of concern in the power line corridor can be avoided through careful routing of the power line and placement of the pylons.

Mitigation measures to reduce residual risk or enhance opportunities:

- Avoid all individuals of *Aloidendron dichotomum* within the site. This would be checked and confirmed at the preconstruction phase walk-through of the facility.
- All personnel at the site should receive induction regarding the illegal harvesting of individuals of *Aloidendron dichotomum*.
- A monitoring programme should be set up before construction to monitor the health of local populations of *Aloidendron dichotomum* to ensure that these are not impacted during construction or operation. Should declines in the local population of this species occur as a result of illegal harvesting, then the local population should be supplemented with seedlings cultivated from locally-sourced seed
- Avoid impact to restricted and specialised habitats such as loose dune areas or quartz patches where present.
- Minimise the development footprint as far as possible and ensure that the management plans for the facility are optimally implemented during the operational phase of the development to ensure that the indirect impacts associated with the development are kept to a minimum.

10.3.3 Decommissioning Impacts

Impact Phase: Decommissioning

Potential impact description: Faunal Impacts

The impacts on fauna at decommissioning would be similar to those at construction, but of a lower severity as the activity will be taking place within the development footprint. The increased levels of noise, pollution, disturbance and human presence during decommissioning would have some negative impacts on fauna. Sensitive and shy fauna are likely to move away from the area during this period as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the decommissioning activities and might be killed. Vehicular traffic would be high and will pose a risk of collisions with susceptible fauna. Slower types such as tortoises, snakes and amphibians would be most susceptible. Some mammals and reptiles would be vulnerable to illegal collection or poaching during the decommissioning phase as a result of

the large number of personnel that are likely to be present. This would however be a transient impact which would ultimately result in an increase in available habitat for some fauna.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	L	M	Negative	M	H	H
With Mitigation	L	L	L	Negative	L	M	H
Can the impact be reversed?			Yes, faunal disturbance would be transient and restricted to the actual decommissioning period.				
Will impact cause irreplaceable loss or resources?			No. No species of high conservation concern are likely to be compromised by the decommissioning of the development.				
Can impact be avoided, managed or mitigated?			Yes to a large extent. Although there would be some unavoidable disturbance at decommissioning, this would be transient and in the long-term the site would be returned to a less disturbed and more natural state.				
Mitigation measures to reduce residual risk or enhance opportunities: - Any potentially dangerous fauna such as snakes or fauna threatened by the decommissioning activities should be removed to a safe location prior to the commencement of decommissioning activities. - 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 (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises. - No excavated holes or trenches should be left open for extended periods as fauna may fall in and become trapped. - All above-ground infrastructure should be removed from the site. Below-ground infrastructure such as cabling can be left in place if it does not pose a risk, as removal of such cables may generate additional disturbance and impact, however, this should be in accordance with the facilities' decommissioning and recycling plan, and as per the agreements with the land owners concerned.							

Impact Phase: Decommissioning							
Potential impact description: Soil Erosion The removal and clearing of the site infrastructure would create some soil disturbance which would leave these areas vulnerable to erosion. The disturbed areas should be rehabilitated at decommissioning with indigenous species sourced from the local environment to reduce this risk.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
WEF							
Without Mitigation	L	H	M	Negative	M	H	H
With Mitigation	L	L	L	Negative	L	L	H
Grid Connection							
Without Mitigation	L	M	L	Negative	L	M	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?			Yes. This impact will not occur if appropriate avoidance measures are put in place.				
Will impact cause irreplaceable loss or resources?			No. If this impact is addressed, then no significant loss of resources will occur.				
Can impact be avoided, managed or mitigated?			Yes, with the appropriate mitigation, this impact can be avoided.				
Mitigation measures to reduce residual risk or enhance opportunities:							

- Using geotextiles and other active rehabilitation measures during and after decommissioning to soil loss and movement at the site. - There should be regular monitoring for erosion for at least 5 years after decommissioning by the applicant or appointed entity to ensure that no erosion problems develop as result of the disturbance, and if they do, to immediately implement erosion control measures. - All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. - All disturbed and cleared areas should be revegetated with indigenous perennial shrubs and succulents from the local area.

10.4 Avifauna

The key potential impact types on avifauna from WEFs and associated infrastructure are:

- Collision with turbines;
- Electrocution;
- Collision with power lines;
- Disturbance and displacement;
- Disruption of bird movements; and
- Habitat destruction.

10.4.1 Construction Impacts

Impact Phase: Construction							
Potential impact description: Habitat destruction During the construction of the WEF and grid connection infrastructure, some habitat destruction and alteration will take place. This happens with the construction of access roads, the clearing of servitudes and areas for tower/pylon placements, and the levelling of substation yards, development of laydown areas and turbine bases. The removal of vegetation which provides habitat for avifauna and food sources may have an impact on birds breeding, foraging and roosting. This habitat destruction is a direct impact that is restricted to the site. If no mitigation (rehabilitation) occurs the impact can be permanent. 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 of a WEF.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	L	Negative	M	L	H
With Mitigation	L	M	L	Negative	L	L	H
Can the impact be reversed?			Partially with rehabilitation				
Will impact cause irreplaceable loss or resources?			No				
Can impact be avoided, managed or mitigated?			Yes				
Mitigation measures to reduce residual risk or enhance opportunities: - High traffic areas and buildings such as offices, batching plants, storage areas etc. must be situated in areas that are already disturbed, if available; - Existing roads and farm tracks must be used where possible; - The minimum footprint area possible of infrastructure must be used, including road widths and lengths; - Highly sensitive zones and no-go areas (e.g. nesting areas) must be cordoned off, clearly marked and avoided unless absolutely necessary; - No off-road driving; - 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 within which construction activities need to be excluded and/or the schedules adjusted;							

- 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 EMPr; - Due to the presence on the WEFR site of some species listed as endangered regionally, or near endemic it is recommended that the project should be subjected to a full CHA (for all taxa and species), and these bird species should be considered in such a CHA.

Impact Phase: Construction							
Potential impact description: Disturbance and Displacement							
Disturbances and noise from staff and construction activities can impact on certain sensitive species particularly whilst feeding and breeding, resulting in effective habitat loss through a perceived increase in predation risk. There are various potentially sensitive species occurring on the WEF site including Northern Black Korhaan and Karoo Korhaan. This can cause these species to be 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.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	L	M	Negative	M	L	M
With Mitigation	L	L	L	Negative	L	L	M
Can the impact be reversed?			Yes				
Will impact cause irreplaceable loss or resources?			No				
Can impact be avoided, managed or mitigated?			Yes				
Mitigation measures to reduce residual risk or enhance opportunities: - A site specific EMPr must be implemented, which gives appropriate and detailed description of how construction activities must be conducted. All contractors are to adhere to the EMPr and should apply good environmental practice during construction; - 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/roosting activity of sensitive species, as well as any additional sensitive habitats. The results must inform the final construction schedule, including abbreviating construction time, scheduling activities around avian breeding and/or movement schedules, and lowering levels of associated noise; - During Construction, if any of the Priority Species or Red Data species identified in this report are observed to be roosting and/or breeding in the vicinity (within 500 m of the power line), the Avifaunal Specialist is to be contacted immediately for further instruction, while a 'no go' buffer of 300 m is to be instituted around the nest site until the specialist has given further instructions; - No nests are to be disturbed or moved; - Sensitive zones and no-go areas are to be designated by the specialist (e.g. nesting sites) and must be clearly marked, cordoned off and avoided unless absolutely necessary; - Environmental Control Officers to oversee activities and ensure that the EMPr is implemented and enforced.							

10.4.2 Operational Impacts

Impact Phase: Operation
Potential impact description: Disturbance and Displacement
Disturbance and displacement by operational activities such as power line and turbine maintenance, fencing, and noise can lead to birds avoiding the area for feeding or breeding, and effectively leading to habitat loss and a potential reduction in breeding success. Small songbirds have been known to have been displaced from operational turbines which cause disturbance through noise, vibrations and shadow-flicker. 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. Some international studies of various species have recorded disturbance distances of 80 m, 100 m, 200 m and 300 from turbine positions, but distances of 400 m, 600 m and up to 800 m have been recorded.

In South Africa the results available thus far have shown little evidence that displacement and disturbance of priority species has occurred (Ralston Paton et al. 2017). However, due to the limited number of operational wind farms in South Africa and short monitoring efforts, the precautionary principle should be applied, and disturbance and displacement must still be regarded as a potential impact.

It is expected that some species potentially occurring on the WEF site will be susceptible to disturbance and displacement, for example smaller passerines such as larks, warblers, flycatchers and chats, as well as large terrestrial Red Data species such as Karoo Korhaan and Ludwig's Bustard. Priority species nesting on the project site (including on new infrastructure e.g. powerline pylons) may be disturbed during routine maintenance.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	M	M	Negative	M	M	M
With Mitigation	L	M	L	Negative	L	L	M

Can the impact be reversed?	Yes
Will impact cause irreplaceable loss or resources?	No
Can impact be avoided, managed or mitigated?	Yes

Mitigation measures to reduce residual risk or enhance opportunities:

- A site specific EMPr 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 EMPr and should apply good environmental practice during all operations.
- The on-site WEF manager (or a suitably appointed Environmental Manager) must be trained by an 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 an avifaunal specialist must be contacted for further instruction;
- Operational phase bird monitoring, in line with applicable guidelines, must be implemented and must include monitoring of all raptor nest sites for breeding success;
- No turbines are to be placed in no-go areas identified through pre-construction monitoring and thereafter, while associated infrastructure should be avoided where possible in these areas.

Impact Phase: Operation

Potential impact description: Collisions with turbines

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 topography of the site; and
- 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).

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 (Marquez *et al.* 2014; 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 (Smallwood & Thelander 2008), and in Tarifa and Navarra in Spain (Barrios & Rodrigues 2004).

Although large birds with poor manoeuvrability (such as cranes, korhaans, and bustards) 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. A minimum of 827 birds of 128 species from 46 families have been killed by turbines in South Africa to date (BLSA 2018). Ralston Paton *et al.* (2017) found that mortality estimates for eight studied wind farms in South Africa ranged from 2.1 to 8.6 birds per turbine per year, which is within range of average estimates from Europe (6.5) and North America (1.6) (Rydell *et al.* 2012). Diurnal raptors and songbirds are the groups most affected by collisions in South Africa to date. Thirteen Red Data species (Taylor *et al.* 2015) have been affected, including fatalities of six Verreaux's' Eagle (*Vulnerable*), five Lanner Falcon (*Vulnerable*), four Martial Eagle (Endangered), and one Ludwig's Bustard (Endangered), all of which have been confirmed as occurring on site. Black Harrier (Endangered), Secretarybird Notably, a large number of the not red listed but endemic Jackal Buzzard (63) have been killed (Ralston Paton *et al.* 2017), as well as a number of Rock Kestrel (33) and passerines such as Bokmakierie (21), White-rumped Swift (21) and Red-capped Lark (24). Some of these fatalities were unexpected as they occurred in areas not identified as sensitive during pre-construction monitoring. Therefore it is important to consider that collisions may not necessarily occur where predicted, and that they can occur away from areas perceived to be preferred use areas. On the other hand, no fatalities have been reported to date for several species predicted to be susceptible to collisions. Due to these uncertainties a pre-cautionary approach was adapted in the assessment of the impact of collisions with turbines. 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. Such recommendations have been made. 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[20]. 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 used internationally during migration events), they should not be discounted and may well hold valuable application in South Africa.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	H	Negative	M	L	M
With Mitigation	L	M	H	Negative	L	L	M
Can the impact be reversed?			No				
Will impact cause irreplaceable loss or resources?			No				
Can impact be avoided, managed or mitigated?			Yes				
Mitigation measures to reduce residual risk or enhance opportunities: - Turbines must not be constructed within any High Sensitivity Zones - Develop and implement a carcass search programme for birds during the first two years of operation, in line with the applicable (i.e. at the start of operations at the wind farm) South African monitoring guidelines; - Develop and implement a 24 month post-construction bird activity monitoring program that mirrors the pre-construction monitoring surveys completed by Arcus and is in line with the applicable South African post-construction monitoring guidelines. This program must include thorough and ongoing nest searches and nest monitoring; - Frequent and regular review of operational phase monitoring data (activity and carcass) and results by an avifaunal 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							

[20] http://www.bbc.com/news/uk-scotland-highlands-islands-42578354

impacts are observed (in the opinion of the bird specialist and independent review), the specialist should conduct a literature review specific to the impact (e.g. collision and/or electrocution) and provide updated and relevant mitigation options to be implemented. As a starting point for the review of possible mitigations, the following may need to be considered:

- 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 (e.g. temporary curtailment or shutdown on demand) to reduce collision risk if absolutely necessary and other methods have not had the desired results.

Impact Phase: Operation

Potential impact description: Collisions with power lines

Collisions with power lines are a well-documented threat to birds in southern Africa (Shaw *et al.* 2018 & 2010, van Rooyen 2004). In addition to their grid connection line to the national grid, wind energy facilities may have overhead lines between turbine strings and substations that pose an additional collision threat. 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-bodied birds such as bustards, cranes and waterbirds, with limited manoeuvrability 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 *et al.* 2015) species vulnerable to power line collisions are generally long-living, slow-reproducing species. 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 particularly affected on the proposed development site include Ludwig's Bustard, Kori Bustard, Karoo Korhaan and Northern Black Korhaan. Ludwig's Bustard and Kori bustard are known to be particularly prone to collision (Shaw *et al.* 2018, pers. comm. R. Simmons, J. Smallie, M. Martins and BARESG, Shaw *et al.* 2010). For Ludwig's Bustard, the threat of collisions with high-voltage transmission lines (>132kV has been found to be higher than for low voltage distribution lines (≤132kV), however the expanse of smaller lines in South Africa may contribute a greater total impact. Collisions have also been shown to be less likely near roads, therefore any new lines should be placed along roads wherever possible (Shaw *et al.* 2018). Martial Eagle has also been documented as colliding with transmission and distribution lines, and while these incidences occur much less frequent than for bustards and korhaans, the impact on this endangered, slow-breeding species' population may be of significance (Shaw *et al.* 2018).

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	H	H	Negative	H	H	H
With Mitigation	L	H	H	Negative	M	L	M

Can the impact be reversed?	No
Will impact cause irreplaceable loss or resources?	No
Can impact be avoided, managed or mitigated?	Yes

Mitigation measures to reduce residual risk or enhance opportunities:

- Place all power lines connecting the turbines with each other and the on-site substation underground, unless technically impossible;
- Place new overhead power lines adjacent to existing power lines or linear infrastructure where possible (e.g. roads and fence lines);
- The shortest possible grid connection route is the preferred alternative, unless it runs along existing infrastructure, in which case a longer route is deemed acceptable if it is constructed in such way that the pylons of the new grid connection are 'staggered' and fall between the pylons of the existing lines as far as possible;
- Attach appropriate marking devices [Bird Flight Diverters (BFDs)] on all spans of all new overhead power lines to increase visibility;
- BFDs must be maintained and replaced where necessary, for the life span of the project and any collision incidents be reported to the Endangered Wildlife Trust (EWT). Prior to construction, an avifaunal specialist must be consulted to provide recommendations regarding the most appropriate (and latest

available technology) device to be used. The specialist should also conduct a pre-construction walk-though of the final approved power line routes, once the pylon positions have been pegged, to determine which (if any) spans may require specialised marking with nocturnal solar powered LED devices;
- 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 any overhead power lines, including the new grid connection line.

Impact Phase: Operation

Potential impact description: Electrocution

Electrocution of birds from electrical infrastructure including overhead lines is an important and well documented cause of bird mortality, especially for raptors and storks. 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. With regard to the grid connection infrastructure, overhead power line infrastructure with a capacity of 132 kV or more does not generally pose a risk of electrocution due to the large size of the clearances between the electrical infrastructure components. Electrocutions are therefore more likely for larger species whose wingspan is able to bridge the gap such as eagles or storks. A few large birds (such as Verreauxs' Eagle and Martial Eagle), susceptible to electrocution (particularly in the absence of safe and mitigated structures) occur in the area. Electrocution is also possible on electrical infrastructure within the substation particularly for species such as crows and owls.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	H	M	Negative	M	M	H
With Mitigation	L	H	M	Negative	L	L	H

Can the impact be reversed?	No
Will impact cause irreplaceable loss or resources?	No
Can impact be avoided, managed or mitigated?	Yes

Mitigation measures to reduce residual risk or enhance opportunities:

- Place new power lines connecting the turbines with each other and the on-site substation underground unless technically impossible;
- Any new overhead power lines must be of a design that minimizes electrocution risk by using adequately insulated 'bird friendly' structures, with clearances between live components of 1.8 m or greater and which provides a safe bird perch. A replica or 'mock up' of the exact pole structures (including bend point structures), or at least a 3D model simulation that specifically shows how the jumpers will be placed and insulated, must be examined and approved by the bird specialist in consultation with EWT.

Impact Phase: Operation

Potential impact description: Disruption of Local Bird Movement Patterns

Wind energy facilities may form a physical barrier to movement of birds across the landscape, this may alter migration routes and increase distances travelled and energy expenditure or block movement to important areas such as ephemeral wetlands or prey sources altogether. This potential impact is not yet well understood, is likely to be more significant as a cumulative impact with surrounding developments, is difficult to measure and assess, and therefore mitigation measures are difficult to identify. Some mitigation may be possible by avoiding turbine placement in obvious flyways and making turbines more visible through lighting, but this will not change the significance of this impact. As flight activity recorded to date is very low for the Paulputs site and there are no waterbodies or obvious flyways this impact is expected to be very unlikely.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	M	L	Negative	L	L	H
With Mitigation	M	M	L	Negative	L	L	H

Can the impact be reversed?	Yes

Will impact cause irreplaceable loss or resources?	No
Can impact be avoided, managed or mitigated?	Yes
Mitigation measures to reduce residual risk or enhance opportunities: - Turbines must not be constructed within any high sensitivity zones identified through pre-construction monitoring and impact assessment; - The lowest feasible number of turbines should be constructed for the required MW output. Therefore, fewer larger (i.e. with a higher MW output) turbine models should be favoured where possible. - Lighting on turbines to be of an intermittent and coloured nature rather than constant white light to reduce the possible impact on the movement patterns of nocturnal migratory species.	

10.5 Bats

WEFs have the potential to impact bats directly through collisions (with spinning turbine blades) and barotrauma resulting in mortality (Horn et al. 2008; Rollins et al. 2012), and indirectly through the modification of habitats (Kunz et al. 2007b; Millon et al. 2018). Similarly, the grid connection may also impact bats directly through collisions (with transmission lines), and indirectly through habitat modification. Modification of habitat includes roost destruction, roosts disturbance, and displacement from foraging areas and/or commuting routes. Direct impacts pose the greatest risk to bats and, in the context of the project, habitat modification impacts should not pose a significant risk because the project footprint (i.e. turbines, roads) is small compared to the size of the project and because of limited roosting spaces at the site. Direct impacts to bats posed by the turbines at the proposed WEF will be limited to species that make use of the airspace in the rotor-swept zone of the wind turbines. Five of the bat species that were recorded on site exhibit behaviour that may bring them into contact with wind turbine blades. They are thus potentially at risk of negative impacts if not properly mitigated. This includes three high risk species (Egyptian free-tailed bat, Natal long-fingered bat and Robert's free-tailed bat) and one medium-high risk species (Cape serotine). The Egyptian free-tailed bat, Natal long-fingered bat and Cape serotine have all suffered mortality at operational wind energy facilities in South Africa. Direct impacts of the grid connection transmission lines would primarily be limited to fruit bats.

A significance rating and impact assessment was done for each impact and mitigation measures for each provided where appropriate. The potential impacts are assessed based on a methodology adapted from Hacking (1998).

10.5.1 Construction Impacts

Impact Phase: WEF Construction							
Potential impact description: Roost disturbance WEFs have the potential to impact bats directly through the disturbance of roosts during construction. Relevant activities include the construction of roads, Operation and Maintenance (O&M) buildings, sub-station(s), internal transmission lines and installation of wind turbines. Excessive noise and dust during the construction phase could result in bats abandoning their roosts, depending on the proximity of construction activities to roosts. This impact will vary depending on the species involved; species that may roost in trees are likely to be impacted more (e.g. Cape serotine and Egyptian free-tailed bats; Monadjem et al. 2010) because tree roosts are less buffered against noise and dust compared to roosts in buildings and rocky crevices. Roosts are limiting factors in the distribution of bats and their availability is a major determinant in whether bats would be present in a particular location. Reducing roosting opportunities for bats is likely to have negative impacts. However, it is unlikely that this impact will occur as there are low numbers of roosting spaces where development is planned. Therefore, the significance of this impact would be low.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	L	L	Negative	L	L	M

With Mitigation	L	L	L	Negative	L	L	M
Can the impact be reversed?	Unknown						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes						

Mitigation measures to reduce residual risk or enhance opportunities:

- It may be possible to limit roost abandonment by avoiding construction activities near roosts. No confirmed roosts have been found at the project but there are potential roosts that bats may be using including trees, rocky crevices and buildings.
- It is recommended that potential roosts, specifically buildings and rocky crevices, are buffered by 200 m, inside which no construction activities may take place. These buffers have been mapped (Figure 2 in the Bat Specialist Report, Volume III).

Impact Phase: WEF Construction

Potential impact description: Roost destruction

WEFs have the potential to impact bats directly through the physical destruction of roosts during construction. Relevant activities include the construction of roads, O&M buildings, sub-station(s), grid connection transmission lines and installation of wind turbines. Potential roosts that may be impacted by construction activities include trees, crevices in rocky outcrops and buildings. Roost destruction can impact bats either by removing potential roosting spaces which reduces available roosting sites or, if a roost is destroyed while bats are occupying the roost, this could result in bat mortality. Reducing roosting opportunities for bats or killing bats during the process of destroying roosts will have negative impacts. However, a low numbers of roosts will likely need to be destroyed resulting in the significance of this impact being low after mitigation.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	H	L	Negative	L	L	M
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?	No						
Will impact cause irreplaceable loss or resources?	Yes						
Can impact be avoided, managed or mitigated?	Yes						

Mitigation measures to reduce residual risk or enhance opportunities:

- The WEF must be designed and constructed in such a way as to avoid the destruction of potential and actual roosts, particularly trees, rocky crevices (if blasting is required) and buildings.
- No construction activities with the potential to physically affect any bat roosts will be permitted without the express permission of a suitably qualified bat specialist following appropriate investigation and mitigation.
- All potential roosts should be buffered by 200 m, inside which no construction activities may take place. If occupied roosts are confirmed larger buffers will be needed depending on the size of the roost and species composition.

Impact Phase: WEF Construction

Potential impact description: Habitat modification

Bats can be impacted indirectly through the modification or removal of habitats (Kunz et al. 2007b) and can also be displaced from foraging habitat by wind turbines (Millon et al. 2018). The removal of vegetation during the construction phase can impact bats by removing vegetation cover and linear features that some bats use for foraging and commuting (Verboom and Huitema 1997). The modification of habitat could create linear edges which some bats to commute or forage along. This modification could also create favourable conditions for insects upon which bats feed which would in turn attract bats. The footprint of the facility is small relative to the remaining habitat available in the surrounding area and as such the removal of vegetation is not likely to result in a significant impact. This impact can be reduced even further by limiting the removal of vegetation as far as possible.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	M	L	Negative	L	L	M
With Mitigation	L	M	L	Negative	L	L	M

Can the impact be reversed?	Yes
Will impact cause irreplaceable loss or resources?	Yes
Can impact be avoided, managed or mitigated?	Yes

Mitigation measures to reduce residual risk or enhance opportunities:

- During construction laydown areas and temporary access roads should be kept to a minimum in order to limit direct vegetation loss and habitat fragmentation. Construction should, where possible, be situated in areas that are already disturbed.
- This impact must be reduced by limiting the removal of vegetation, particularly trees, as far as possible.
- Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and a habitat restoration plan must be developed by a specialist and included within the EMPr.

Impact Phase: Grid Connection Construction

Potential impact description: Roost disturbance

The grid connection infrastructure may impact bats directly through the disturbance of roosts during construction. Excessive noise and dust during the construction phase could result in bats abandoning their roosts, depending on the proximity of construction activities to roosts. This impact will vary depending on the species involved; species that may roost in trees are likely to be impacted more (e.g. Cape serotine and Egyptian free-tailed bats; Monadjem et al. 2010) because tree roosts are less buffered against noise and dust compared to roosts in buildings and rocky crevices. Roosts are limiting factors in the distribution of bats and their availability is a major determinant in whether bats would be present in a particular location. Reducing roosting opportunities for bats is likely to have negative impacts.

Grid connection route Option 1 is the preferred route to limit impacts to bats. Option 2 comes into closer proximity to potential roosting sites in a nearby mountain, to the north of the route, and smaller rock outcrops along the route.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	L	L	Negative	L	L	M
With Mitigation	L	L	L	Negative	L	L	M

Can the impact be reversed?	Unknown
Will impact cause irreplaceable loss or resources?	No
Can impact be avoided, managed or mitigated?	Yes

Mitigation measures to reduce residual risk or enhance opportunities:

- As this impact is unlikely to occur, no mitigation options are required.

Impact Phase: Grid Connection Construction

Potential impact description: Roost destruction

The grid connection infrastructure may impact bats directly through the physical destruction of roosts during construction. Roosts are limiting factors in the distribution of bats and their availability is a major determinant in whether bats would be present in a particular location. Reducing roosting opportunities for bats is likely to

have negative impacts. Potential roosts that may be impacted by construction activities include rocky crevices. Roost destruction can impact bats either by removing potential roosting spaces which reduces available roosting sites or, if a roost is destroyed while bats are occupying the roost, this could result in bat mortality. Reducing roosting opportunities for bats or killing bats during the process of destroying roosts will have negative impacts. However, no or a low number of roosts will likely need to be destroyed resulting in the significance of this impact being low after mitigation.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	L	Negative	M	L	M
With Mitigation	L	L	L	Negative	L	L	M
Can the impact be reversed?			No				
Will impact cause irreplaceable loss or resources?			Yes				
Can impact be avoided, managed or mitigated?			Yes				
Mitigation measures to reduce residual risk or enhance opportunities: - As this impact is unlikely to occur, no mitigation options are required.							

10.5.2 Operational Impacts

Impact Phase: WEF Operation							
Potential impact description: Habitat creation in high risk locations The construction of a WEF and associated building infrastructure may inadvertently provide new roosts for bats, attracting them to the area and indirectly increasing the risk of negative mortality impacts. It has been suggested that some bats may investigate wind turbines for their potential roosting spaces (Cryan et al. 2014; Horn et al. 2008; Kunz et al. 2007b) and bats could therefore be attracted to WEFs, increasing the chance of wind turbine-induced mortality. Bats may also be attracted to roosting opportunities in new buildings and other infrastructure such as road culverts at WEFs (J. Aronson, personal observation), or be attracted to lights at the WEF as potential new foraging areas. The probability of large numbers of bats roosting in infrastructure at the project is low. However, if any bats do manage to do so, they would be at greater risk of mortality due to the proximity to wind turbines.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	M	L	Negative	M	M	M
With Mitigation	L	M	L	Negative	L	L	M
Can the impact be reversed?			Yes				
Will impact cause irreplaceable loss or resources?			Yes				
Can impact be avoided, managed or mitigated?			Yes				
Mitigation measures to reduce residual risk or enhance opportunities: - Bats should be prevented from entering any possible artificial roost structures (e.g. roofs of buildings, road culverts and wind turbines) by ensuring that they are sealed in such a way as to prevent bats from entering. If bats colonise WEF infrastructure, a suitably qualified bat specialist should be consulted before any work is undertaken on that infrastructure or attempting to remove bats. Ongoing maintenance and inspections of buildings and road culverts must be carried out to ensure no access to bats or actively roosting bats.							

Impact Phase: WEF Operation
Potential impact description: Bat mortality during commuting and/or foraging The major potential impact of wind turbines on bats is direct mortality resulting from collisions with turbine blades and/or barotrauma (Grodsky et al. 2011; Horn et al. 2008; Rollins et al. 2012). These impacts will be

limited to species that make use of the airspace in the rotor-swept zone of the wind turbines. All species of bat that were recorded at the project exhibit behaviour that may bring them into contact with wind turbine blades and so they are potentially at risk of negative impacts.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	H	H	Negative	H	M	M
With Mitigation	L	H	L	Negative	L	L	M

Can the impact be reversed?	No
Will impact cause irreplaceable loss or resources?	Yes
Can impact be avoided, managed or mitigated?	Yes

Mitigation measures to reduce residual risk or enhance opportunities:

- Designing the layout of the project to avoid areas that are more frequently used by bats may reduce the likelihood of mortality and should be the primary mitigation measure. These areas include key microhabitats such as water features, trees, buildings, and rocky crevices. This has been adhered to as all turbines adhere to buffer zones around these features. All buffers are to blade tip.
- The height of the lower blade swept area must be maximised.
- Operational acoustic monitoring and carcass searches for bats must be performed, based on best practice, to monitor mortality and bat activity levels. Acoustic monitoring should include monitoring at height (from more than one location i.e. such as on turbines) and at ground level.
- If mortality does occur beyond threshold levels as determined based on applicable guidance (MacEwan et al. 2018), mitigation needs to be considered. Mitigation options may include using ultrasonic deterrents, raising the cut-in speeds of turbines and turbine blade feathering. Any operational minimization strategy (i.e. curtailment) should be targeted during specific seasons and time periods for specific turbines coincident with periods of increased bat activity.
- Apply curtailment during February, August and October based on Bat Curtailment Plan if mortality does occur beyond threshold levels as determined based on applicable guidelines.

Impact Phase: WEF Operation

Potential impact description: Bat mortality during migration

It has been suggested that some bats may not echolocate when they migrate (Baerwald and Barclay 2009) which could explain the higher numbers of migratory species suffering mortality in WEF studies in North America and Europe. Therefore, the direct impact of bat mortality may be higher when they migrate compared to when they are commuting or foraging. This is therefore considered here as a separate impact of the WEF on the Natal long-fingered bat, which is the only species recorded during pre-construction monitoring known to exhibit long-distance migratory behaviour.

The majority of bat mortalities at WEFs in North America and Europe are migratory species. However, evidence from the pre-construction monitoring does not suggest migratory behaviour through the site. It is therefore unlikely that mortality will occur during migration periods but during the operating lifespan of the WEFs it may be possible that migration patterns and species distributions may change in response to climactic and/or habitat shifts. There may also be inter-annual variation in bat movement patterns which cannot be observed with a single year of data collection.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	H	H	H	Negative	M	L	M
With Mitigation	M	H	L	Negative	L	L	M

Can the impact be reversed?	No
Will impact cause irreplaceable loss or resources?	Yes
Can impact be avoided, managed or mitigated?	Yes

Mitigation measures to reduce residual risk or enhance opportunities:

- Designing the layout of the project to avoid areas that are more frequently used by bats may reduce the likelihood of mortality and should be the primary mitigation measure. These areas include key microhabitats such as water features, trees, buildings, and rocky crevices. This has been adhered to as all turbines adhere to buffer zones around these features (Figure 2). All buffers are to blade tip.
- The height of the lower blade swept area must be maximised.
- Operational acoustic monitoring and carcass searches for bats must be performed, based on best practice, to monitor mortality and bat activity levels. Acoustic monitoring should include monitoring at height (from more than one location i.e. such as on turbines) and at ground level.
- If mortality does occur beyond threshold levels as determined based on applicable guidance, mitigation needs to be considered. Mitigation options may include using ultrasonic deterrents, raising the cut-in speeds of turbines and turbine blade feathering. Any operational minimization strategy (i.e. curtailment) should be targeted during specific seasons and time periods for specific turbines coincident with periods of increased bat activity.
- Apply curtailment during February, August and October based on Bat Curtailment Plan if mortality does occur beyond threshold levels as determined based on applicable guidelines.

Impact Phase: WEF Operation

Potential impact description: Light pollution

Currently the local region experiences very little light pollution from anthropogenic sources and the construction of a WEF will marginally increase light pollution. This excludes turbine aviation lights which do not appear to impact bats (Baerwald and Barclay 2011; Horn et al. 2008; Jain et al. 2011; Johnson et al. 2003). During the operation of the WEF, it is assumed that the only light sources would be motion sensor security lighting for short periods and lighting associated with the substation.
This artificial lighting would impact bats indirectly via the mortality of their insect prey thereby reducing foraging opportunities for certain bat species. Lighting attracts (Blake et al. 1994; Rydell 1992; Stone 2012) and can cause direct mortality of insects. These local reductions in insect prey may reduce foraging opportunities for bats, particularly for species that avoid illuminated areas. This impact is likely to be low after mitigation because, relative to the large area in the region that would not be developed that likely supports large numbers of insects, the prey resource for bats is likely to be sufficient.
Other bat species actively forage around artificial lights due to the higher numbers of insects which are attracted to these lights (Blake et al. 1994; Rydell 1992; Stone 2012). This may bring these species into the vicinity of the project and indirectly increase the risk of collision/barotrauma particularly for species that are known to forage around lights. These include the Cape serotine and the Egyptian free-tailed bat (Fenton et al. 2004; J. Aronson, personal observation). This impact is likely to be low with mitigation but must be carefully considered because the consequence could be severe without mitigation. Lighting at the project should be kept to a minimum and appropriate types of lighting should be used to avoid attracting insects, and hence, bats.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	M	L	Negative	M	M	M
With Mitigation	L	M	L	Negative	L	L	H

Can the impact be reversed?	Yes
Will impact cause irreplaceable loss or resources?	Yes
Can impact be avoided, managed or mitigated?	Yes

Mitigation measures to reduce residual risk or enhance opportunities:

- This impact can be mitigated by using as little lighting as possible, and only where essential for operation of the facility.
- Where lights need to be used such as at the substation and switching station and elsewhere, these should have low attractiveness for insects such as low pressure sodium and warm white LED lights (Rydell 1992; Stone 2012). High pressure sodium and white mercury lighting is attractive to insects (Blake et al. 1994; Rydell 1992; Svensson & Rydell 1998) and should not be used as far as possible.

- Lighting should be fitted with movement sensors to limit illumination and light spill, and the overall lit time. In addition, the upward spread of light near to and above the horizontal plane should be restricted and directed to minimise light trespass and sky glow. - Increasing the spacing between lights, and the height of light units can reduce the intensity and volume of the light to minimise the area illuminated and give bats an opportunity to fly in relatively dark areas between and over lights.

Impact Phase: Grid Connection Operation							
Potential impact description: Bat mortality through collision with transmission lines Insectivorous bats are unlikely to collide with transmission lines due to their ability to echolocate. They are therefore able to detect and avoid obstacles in their path, such as electrical cabling. Fruit bats do not echolocate in the same manner and can collide and become electrocuted by transmission lines. There is no published evidence of this in South Africa but these events do occur globally. The existence of suitable caves for roosting and fruit trees along or across this route may increase the likelihood that fruit bats will be present however there are none of these features along the proposed grid connection routes.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	M	L	Negative	L	L	M
With Mitigation	L	M	L	Negative	L	L	M
Can the impact be reversed?			No				
Will impact cause irreplaceable loss or resources?			Yes				
Can impact be avoided, managed or mitigated?			Yes				
Mitigation measures to reduce residual risk or enhance opportunities: - As this impact is unlikely to occur, no mitigation options are provided.							

10.5.3 Decommissioning Impacts

The impacts to bats during the decommissioning phase (for both the wind energy facility and the associated grid connection) are likely to be restricted to disturbance. This impact should be low and therefore not assessed in any further detail.

10.6 Noise

As only four potential noise-sensitive developments have been identified (of which one is currently unoccupied), the extent of effects is considered to be Low.

Noise due to the construction and operation of the proposed development has been determined at the closest, and therefore most noise-sensitive developments, in accordance with internationally recognised methodologies.

The predicted noise levels have then been assessed against a number of criteria incorporating South African and international guidance. The worst-case level of impact was found to be Low at the closest noise-sensitive development, with no impacts anticipated for more distant noise-sensitive developments.

10.6.1 Construction Impacts

Noise sources during construction would consist of the equipment and vehicles used in the construction process. The duration of effects would be limited to no more than 24 months, and therefore considered to be Low.

As the desired rating levels would not be exceeded, effects are considered to be neutral.

As the predicted noise levels from each construction activity are lower than the typical district rating levels defined in SANS 10103, the likelihood of adverse community response during the construction process is considered to be low. Predicted noise levels have been calculated in accordance with a well-established methodology (BS 5228-1:2009+A1:2014); the level of confidence in the assessment is high.

The worst-case impacts of any of the three potential grid connection options have been considered; as such, any of the proposed options would be acceptable.

The impact of noise effects during construction is assessed as Low, and therefore Not Significant.

Impact Phase: Construction							
Potential impact description: Noise Noise from equipment and vehicles used during construction of the Development. The noise emission data presented in Section 4.1.1 of the Noise Specialist Report, Volume III, has been used to calculate overall noise levels for each activity at a reference distance of 10 m, as follows: • Construction of tracks and hardstanding: 92 dB L_{Aeq} • Excavation and concreting of turbine foundations: 88 dB L_{Aeq} • Turbine Erection: 86 dB L_{Aeq} • Generator: 66 dB L_{Aeq}							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	L	L	Neutral	L	L	H
With Mitigation	L	L	L	Neutral	L	L	H
Can the impact be reversed?			YES - construction period is temporary.				
Will impact cause irreplaceable loss or resources?			NO – construction period is temporary.				
Can impact be avoided, managed or mitigated?			YES – through application of good practice during construction.				
Mitigation measures to reduce residual risk or enhance opportunities: - Construction activities shall be limited to agreed times; - Deliveries of turbine components, plant and materials by HGV to site shall only take place by designated routes and within agreed times; - The site contractors shall be required to employ the best practicable means of reducing noise emissions from plant, machinery and construction activities; - Where practicable, the work programme will be phased; - Where practicable, noise from fixed plant and equipment will be contained within suitable acoustic enclosures or behind acoustic screens; - Where practicable, night time working should not be carried out; - Local residents shall be notified in advance of any night-time construction activities likely to generate significant noise levels; and - Any plant and equipment normally required for operation at night (23:00 - 07:00), e.g., generators, should be suitably screened or located such that noise levels from the plant do not exceed 45 dBA, L_{Feq} at the nearest noise-sensitive receptors.							

10.6.2 Operational Impacts

The duration of effects would be for the full operational life of the development, i.e. 25 years, which is considered to be High.

The predicted maximum operational noise level from the Development at the closest potential noise-sensitive development (H3) is 44 dBA, L_{Feq}. Based on the significance criteria the impact intensity is therefore Low. As the desired rating levels would not be exceeded, the probability of an adverse effect is Low during both daytime and night-time periods, and effects are considered to be Neutral.

The level of confidence in the assessment is High. The impact of noise effects during operation are assessed as Low, and therefore Not Significant.

Impact Phase: Operation							
Potential impact description: Day-time Noise The maximum operational noise level from the Development has been estimated to be 44 dB, L_{Aeq} at the closest identified potential noise-sensitive development (H3). This property is currently uninhabited, but has been assessed in the interest of presenting a worst-case assessment.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	L	Neutral	L	L	H
With Mitigation	L	H	L	Neutral	L	L	H
Can the impact be reversed?			YES – operational noise will cease when the Development is decommissioned.				
Will impact cause irreplaceable loss or resources?			NO – operational noise will cease when the Development is decommissioned.				
Can impact be avoided, managed or mitigated?			YES – noise emission from the wind turbines could be reduced, however this is not necessary in respect of this impact.				
Mitigation measures to reduce residual risk or enhance opportunities: Noise due to the operation of the proposed development is not to exceed 45 dBA, LFeq,8hr at any residential dwelling present at the time of this consent. In addition to the above, it is also recommended that a condition is attached requiring operational noise monitoring to be undertaken at the closest residential dwelling (H3), within 6 months of the development being fully commissioned. In the event that the development is found to exceed the noise limit specified above, the operator should implement a noise abatement programme in consultation with a suitably qualified Acoustics Consultant, and a further measurement undertaken to determine compliance. This cycle should continue until it can be demonstrated that the development is operating within its specified noise limit.							

Impact Phase: Operation							
Potential impact description: Night-time Noise The maximum operational noise level from the Development has been estimated to be 44 dBA, L_{Feq} at the closest identified potential noise-sensitive development.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	L	Negative	L	L	H
With Mitigation	L	H	L	Neutral	L	L	H
Can the impact be reversed?			YES – operational noise will cease when the Development is decommissioned.				
Will impact cause irreplaceable loss or resources?			NO – operational noise will cease when the Development is decommissioned.				
Can impact be avoided, managed or mitigated?			YES – noise emission from the wind turbines could be reduced, through the measures detailed below, if property H3 remains uninhabited.				
Mitigation measures to reduce residual risk or enhance opportunities: - Not required.							

10.6.3 Decommissioning Impacts

Noise sources during decommissioning would be similar to, though fewer than, those during construction and the duration shorter. Effects during decommissioning would therefore be no greater than those during construction. The impact of noise effects during decommissioning is assessed as Low, and therefore Not Significant.

Impact Phase: Decommissioning							
Potential impact description: Decommissioning Noise The maximum operational noise level from the Development has been estimated to be 44 dB, L_{Aeq} at the closest identified potential noise-sensitive development.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	L	L	Neutral	L	L	H
With Mitigation	L	L	L	Neutral	L	L	H
Can the impact be reversed?			YES - construction period is temporary.				
Will impact cause irreplaceable loss or resources?			NO – construction period is temporary.				
Can impact be avoided, managed or mitigated?			YES – through application of good practice during construction.				
Mitigation measures to reduce residual risk or enhance opportunities: - Decommissioning activities shall be limited to agreed times; - Deliveries of plant and materials by HGV to site shall only take place by designated routes and within agreed times; - The site contractors shall be required to employ the best practicable means of reducing noise emissions from plant, machinery and decommissioning activities; - Where practicable, the work programme will be phased; - Where practicable, noise from fixed plant and equipment should be contained within suitable acoustic enclosures or behind acoustic screens; - Where practicable, night time working will not be carried out. - Local residents shall be notified in advance of any night-time activities likely to generate significant noise levels; and - Any plant and equipment normally required for operation at night (23:00 - 07:00), e.g., generators, should be suitably screened or located such that noise levels from the plant do not exceed 45 dBA, L_{Feq} at the nearest noise-sensitive receptors.							

10.7 Heritage, Archaeology and Palaeontology

Any impact to an archaeological or palaeontological resource or a grave is deemed unacceptable until such time as the resource has been inspected and studied further if necessary. Impacts to the landscape are difficult to quantify but in general a development that visually dominates the landscape from many vantage points is undesirable. Because of the height of the proposed development, it will be highly visible but from a moderate distance it would not strongly dominate the landscape. This is partly due to the fact that the turbines would be placed in a cluster.

10.7.1 Impacts to archaeological resources and graves

Impacts to archaeological resources and graves would occur during the construction phase when the ground surface is disturbed, when vegetation is cleared and foundations are excavated. These would be direct impacts. However, the very minimal amount of archaeology likely to be present in the development footprint and the rarity of graves means that the impacts would be of limited intensity. The possibility does remain, however, that a site or grave might fall within the footprint and the intensity is thus rated as medium. The kinds of sites likely to be found are of local heritage significance so the extent of impacts would be local. Impacts to archaeological resources are destructive and hence permanent but the probability of impacts occurring is deemed to be low because of the effort made by the developer to avoid pans, rock outcrops and rocky hills which are the most sensitive parts of the study area. The overall impact significance before mitigation is thus likely to be low. Should any sites end up being within the development footprint, then the nature of the archaeology in this area (shallow, surface occurrences only) means that mitigation could be very easily affected. Graves may not be detectable at the surface and might only be discovered during construction. Although there is a low probability of sites being found, the chances are not zero and some significant sites have been found and mitigated in this way (Orton 2016a). The intensity of impacts would reduce to low and the impact significance after mitigation would be low. There are no fatal flaws in terms of archaeology.

The assessment of impacts to archaeology and graves for the power line and substation is identical to that for the wind energy facility. Although all three Options pass through areas that could possibly contain archaeology and that have not been surveyed yet, the very light footprint of a power line means that the probability of impacts occurring remains low. There is no difference between the substation alternatives and, because of the minimal amount of archaeology on the landscape, the length of the associated power line also makes no difference to the assessment.

Impact Phase: Construction							
Potential impact description: Impacts to archaeological resources and graves Archaeological resources on the ground (artefacts, occupation debris) and graves can be damaged and/or destroyed during construction activities.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	M	Negative	L	L	H
With Mitigation	L	H	L	Negative	L	L	H
Can the impact be reversed?		No					
Will impact cause irreplaceable loss or resources?		Yes					
Can impact be avoided, managed or mitigated?		Yes, archaeological mitigation can be easily implemented. Graves can be exhumed and/or relocated.					
Mitigation measures to reduce residual risk or enhance opportunities: - Commission a pre-construction archaeological survey to check the actual footprint of the development. This survey will identify any sites that require mitigation. - Protect and report any graves or dense concentrations of artefacts found during vegetation clearing or excavation of foundations.							

10.7.2 Impacts to palaeontological resources

Impacts to palaeontological resources could occur during the construction phase. The chances of fossils being found on the site are very low because the nature of the geology is generally not conducive to fossils being present. It remains possible, however, that rare, isolated bones might be present and could be damaged or destroyed during construction activities. Because of the rarity of such finds, the impact intensity could be medium. Destruction of fossils is permanent but the chances of this occurring are very low. Before mitigation the impacts are likely to be of low significance. Post-mitigation significance becomes low positive because fossils would never be found without construction and there is thus the potential for an advancement of scientific knowledge. There are no fatal flaws in terms of impacts to palaeontology.

The assessment of impacts to palaeontology for the power line and substation is identical to that for the wind energy facility. There is no difference between the substation alternatives and, because of the very low chance of encountering fossils, the length of the associated power line also makes no difference to the assessment.

Impact Phase: Construction							
Potential impact description: Impacts to palaeontological resources Palaeontological resources in the ground (fossil bones) can be damaged and/or destroyed during construction activities.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	M	Negative	L	L	H
With Mitigation	L	H	L	Positive	L	L	H
Can the impact be reversed?		No					
Will impact cause irreplaceable loss or resources?		Yes					
Can impact be avoided, managed or mitigated?		Yes, palaeontological mitigation can be implemented but the chances of it being effective are limited.					
Mitigation measures to reduce residual risk or enhance opportunities: - Protect and report any fossil bones found during vegetation clearing or excavation of foundations.							

10.7.3 Impacts to cultural landscapes on the WEF

The cultural landscape and N14 route traversing it would be impacted during all stages of the development since it is the presence of the facility and associated construction equipment (industrial character) within the rural/natural landscape that results in impacts. Although the industrial nature of the facility is distinctly different to the surrounding landscape, the landscape is large and can likely absorb the development. Furthermore, although not within a Renewable Energy Development Zone, the area has been identified for renewable energy development with several solar energy facilities already present nearby. The intensity of impacts is thus likely to be medium. The impacts will be of local extent but, if construction goes ahead, they would definitely occur. The significance of impacts before mitigation is likely to be medium. Because mitigation cannot hide the turbines, the significance of impacts after mitigation remains medium. There are no fatal flaws in terms of impacts to the cultural landscape.

Impact Phase: WEF all Phases							
Potential impact description: Impacts to the cultural landscape The rural/natural landscape is affected by the visual intrusion into it of electrical infrastructure and construction equipment and machinery.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	M	Negative	M	H	H
With Mitigation	L	H	M	Negative	M	H	H
Can the impact be reversed?		Yes					
Will impact cause irreplaceable loss or resources?		No					

Can impact be avoided, managed or mitigated?	No, but minor visual mitigation measures should still be applied as best practice.
Mitigation measures to reduce residual risk or enhance opportunities: - Maximise the distance between the turbines and the N14; - Ensure effective rehabilitation of areas not required during operation (e.g. temporary laydown areas); - Minimise lighting; and - Any other best practice visual mitigation measures suggested by the visual specialist.	

10.7.4 Comments from SAHRA

In an Interim Comment issued on 30/05/2019, SAHRA accepted the motivation to reduce the buffer between the closest wind turbine and the N14 to 500 m. The final comment from SAHRA Archaeology, Palaeontology and Meteorites (APM) Unit has no objections to the proposed development and the recommendations provided by the specialists are supported and must be adhered to. SAHRA provided specific conditions as follows:

- A report detailing the results of the recommended walkdowns of the final layouts of the powerline and WEF must be compiled by a qualified archaeologist and submitted to SAHRA for comment once completed;
- 38(4)c(i) – If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted as per section 35(3) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule;

- 38(4)c(ii) – If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule;
- 38(4)d – See section 51(1) of the NHRA;
- 38(4)e – The following conditions apply with regards to the appointment of specialists:
- If heritage resources are uncovered during the course of the development, a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the heritage resource. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA;
- The Final EIA and EMPr must be submitted to SAHRA for record purposes;
- The decision regarding the EA Application must be communicated to SAHRA and uploaded to the SAHRIS Case application.

10.7.5 Impacts to cultural landscapes on the Grid Connection

The cultural landscape and N14 traversing it would be impacted during all stages of the development since it is the presence of the powerline, substation and associated construction equipment within the rural/natural landscape that results in impacts. The landscape is large and can likely absorb the development. Furthermore, several power lines and substations are already present nearby, both associated with the national grid and the existing solar energy facilities. The intensity of impacts is thus likely to be low. The impacts will be of local extent but, if construction goes ahead, they would definitely occur. The significance of impacts before mitigation is likely to be medium. No mitigation measures that can reduce impacts are feasible but best practice visual mitigation measures such as ensuring effective rehabilitation of areas disturbed during construction should be implemented. The visual impact assessment would make further recommendations in this regard. Because mitigation cannot hide the power line, the significance of impacts after mitigation remains medium. There are no fatal flaws in terms of impacts to the cultural landscape.

It is the long term duration of the impacts that has the greatest bearing on the significance and hence despite the intensity being lower than that for the wind turbines, the significance still calculates to medium. Because a power line would have to cross the N14 anyway to link the two parts of the WEF, there is little to no difference in the intensity of the impacts for the various proposed substations. In general, however, it would be preferred to construct at Option A due to its greater distance from the N14.

Note that because of the very minimal amount of archaeology present on the site the precolonial cultural landscape has been considered within archaeology.

Impact Phase: Grid Connection all Phases							
Potential impact description: Impacts to the cultural landscape The rural/natural landscape is affected by the visual intrusion into it of electrical infrastructure and construction equipment and machinery.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	L	Negative	M	H	H
With Mitigation	L	H	L	Negative	M	H	H
Can the impact be reversed?			Yes				
Will impact cause irreplaceable loss or resources?			No				
Can impact be avoided, managed or mitigated?			No, but minor visual mitigation measures should still be applied as best practice.				
Mitigation measures to reduce residual risk or enhance opportunities: - Ensure effective rehabilitation of areas not required during operation (e.g. temporary laydown areas); and - Any other best practice visual mitigation measures suggested by the visual specialist.							

10.8 Visual

10.8.1 Receptor Impact Rating

At each sensitive receptor location a matrix was applied taking into consideration the distance of a receptor location from the proposed development (zones of visual impact), the presence of screening elements (topography, vegetation etc.), and visual contrast of the development with the landscape pattern and form.

A high impact rating has been assigned to receptor locations that are located within 2km of the proposed WEF development and within 500m of the nearest power line assessment corridor. Beyond 10km, the visual impact of a WEF diminishes considerably, as the development would appear to merge with the elements on the horizon.

In order to determine the likely visual compatibility of the proposed development, the study area was classified into the following zones of visual contrast:

- **High** - undeveloped / natural / rural areas

- **Moderate** - areas within 500 m of any existing power line in undeveloped / natural / rural area, and also areas between 1 and 2 km from the KaXu, !Xina and Konkoonsies SEFs.
- **Low** - areas within 500m of Paulputs substation, and areas within 1km of KaXu, !Xina and Konkoonsies SEFs

Table 10.1 shows the matrix score which in turn determines the visual impact rating assigned to each receptor location. An explanation of the matrix is provided in the VIA Report (Volume III).

Table 10.1: Rating scores

Rating	Overall Score
High Visual Impact	8-9
Moderate Visual Impact	5-7
Low Visual Impact	3-4
Negligible Visual Impact	(overriding factor)

Furthermore, a summary of the overall visual impact of the proposed development on each of the potentially sensitive visual receptor locations which were identified within the study area is presented in the VIA Report (Volume III). Due to access limitations, the identified potentially sensitive visual receptor locations were not fully investigated from a visual perspective during the time of the field investigation. Notwithstanding this limitation, these receptor locations were still regarded as being potentially sensitive to the visual impacts associated with the proposed development and were assessed as part of the VIA, via desktop means where required.

Three (3) of the potentially sensitive receptors would experience high levels of visual impact as a result of the proposed Paulputs WEF development. All of these receptors are farmsteads located in relatively close proximity to the application site and this factor, in conjunction with the relatively flat terrain in the area, gives rise to a high impact rating. None of these receptors are tourism-related facilities however, and as such they are not considered to be Sensitive Receptors. Thus the high impact rating assigned will not affect the overall impact ratings. The remaining thirteen (13) receptor locations affected by the proposed WEF would be subjected to moderate levels of visual impact as a result of the proposed development. All eleven (11) receptor locations identified within 5kms of the proposed power line assessment corridors would experience moderate levels of visual impact from the grid connection infrastructure.

10.8.2 Night-time impacts

The visual impact of lighting on the nightscape is largely dependent on the existing lighting present in the surrounding area at night. Much of the study area is characterised by natural areas with pastoral elements and low densities of human settlement and as a result, relatively few light sources are present in the broader area surrounding the proposed development site. The closest built-up area is the town of Pofadder which is situated approximately 50km south-west of the application site and is thus too far away to have significant impacts on the night scene. At night, the general study area is characterised by a picturesque dark starry sky and the visual character of the night environment across the broader area is largely 'unpolluted' and pristine. Sources of light in the area are largely limited to isolated lighting from surrounding farmsteads and transient light from the passing cars travelling along the N14 national route. Some light pollution is however likely to emanate from the operational and security lighting at Paulputs substation and the adjacent

KaXu, !Xina and Konkoonsies SEFs, thus reducing the impacts of additional lighting in the area.

Given the scale of the proposed WEF, the operational and security lighting required for the proposed project is likely to intrude on the nightscape and create glare, which will contrast with the dark backdrop of the surrounding area. In addition, any red hazard lights placed on top of the turbines may be particularly noticeable as their colour will differ from the few lights typically found within the environment and the flashing will draw attention to them.

Power lines and associated towers or pylons are not generally lit up at night and, thus light spill associated with the proposed grid connection infrastructure is only likely to emanate from the proposed on-site substation. Lighting from this facility is expected to intrude on the nightscape to some degree. It should however be noted that the grid connection infrastructure will only be constructed if the proposed Paulputs WEF is developed and thus the lighting impacts from the proposed substation would be subsumed by the glare and contrast of the lights associated with the WEF. As such, the grid connection infrastructure is not expected to result in significant lighting impacts.

10.8.3 Turbine Colour

Bright colours and distinctive logos on the wind turbines could increase the level of contrast with the landscape and exacerbate visual clutter. It is however understood that the Civil Aviation Authority requires that turbines are painted white and this would decrease the level of visual contrast. The painting of one or more rotor blades in a different colour, to accommodate avifaunal protection measures for example, would increase the visual impacts of the turbines to some extent, but this increase is not sufficient to increase the impact ratings. From a visual perspective however, it would be preferred if the colour used for this purpose is restricted to black or grey.

10.8.4 Construction and Decommissioning Impacts

Visual impacts during the decommissioning phase are potentially similar to those associated with the construction phase.

Impact Phase: Construction and Decommissioning

Potential impact description: Visual Impacts of the Paulputs WEF

- Large construction vehicles and equipment will alter the natural character of the study area and expose visual receptors to impacts associated with construction.
- Construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings.
- Dust emissions and dust plumes from increased traffic on the gravel roads serving the construction site may evoke negative sentiments from surrounding viewers.
- Surface disturbance during construction would expose bare soil (scarring) which could visually contrast with the surrounding environment.
- Temporary stockpiling of soil during construction may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	L	M	Negative	M	M	M
With Mitigation	M	L	L	Negative	L	M	M
Can the impact be reversed?			YES – the negative effects of construction will cease once construction is complete				
Will impact cause irreplaceable loss or resources?			YES – there will be marginal loss of resources				

Can impact be avoided, managed or mitigated?	YES – mitigation measures can reduce impacts

Mitigation measures to reduce residual risk or enhance opportunities:

- Carefully plan to mimimise the construction period and avoid construction delays.
- Inform receptors of the construction programme and schedules.
- Minimise vegetation clearing and rehabilitate cleared areas as soon as possible.
- Vegetation clearing should take place in a phased manner.
- Maintain a neat construction site by removing rubble and waste materials regularly.
- Make use of existing gravel access roads where possible.
- Limit the number of vehicles and trucks travelling to and from the proposed site, where possible.
- Unless there are water shortages, ensure that dust suppression techniques are implemented
    - on all access roads;
    - in all areas where vegetation clearing has taken place; and
    - on all soil stockpiles.

Impact Phase: Construction and Decommissioning

Potential impact description: On-site infrastructure associated with the Paulputs WEF

- Large construction vehicles and equipment will alter the natural character of the study area and expose visual receptors to impacts associated with construction.
- Construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings.
- Dust emissions and dust plumes from increased traffic on the gravel roads serving the construction site may evoke negative sentiments from surrounding viewers.
- Surface disturbance during construction would expose bare soil which could visually contrast with the surrounding environment.
- Temporary stockpiling of soil during construction may alter the flat landscape. Wind blowing over these disturbed areas could result in dust emissions which would have a visual impact.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	L	M	Negative	M	M	M
With Mitigation	M	L	L	Negative	L	M	M

Can the impact be reversed?	YES – the negative effects of construction will cease once construction is complete
Will impact cause irreplaceable loss or resources?	YES – there will be marginal loss of resources
Can impact be avoided, managed or mitigated?	YES – mitigation measures can reduce impacts

Mitigation measures to reduce residual risk or enhance opportunities:

- Carefully plan to mimimise the construction period and avoid construction delays.
- Minimise vegetation clearing and rehabilitate cleared areas as soon as possible.
- Vegetation clearing should take place in a phased manner.
- Maintain a neat construction site by removing rubble and waste materials regularly.
- Make use of existing gravel access roads where possible.
- Limit the number of vehicles and trucks travelling to and from the proposed sites, where possible.
- Unless there are water shortages, ensure that dust suppression techniques are implemented
    - on all access roads;
    - in all areas where vegetation clearing has taken place; and
    - on all soil stockpiles.

Impact Phase: Construction and Decommissioning

Potential impact description: Grid infrastructure associated with the Paulputs WEF

- Large construction vehicles and equipment will alter the natural character of the study area and expose visual receptors to impacts associated with construction.
- Construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings.

• Dust emissions and dust plumes from increased traffic on gravel roads serving the construction site may evoke negative sentiments from surrounding viewers. • Surface disturbance during construction would expose bare soil which could visually contrast with the surrounding environment. • Vegetation clearance required for the construction of the proposed substation is expected to increase dust emissions and alter the natural character of the surrounding area, thus creating a visual impact. • Temporary stockpiling of soil during construction may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	L	M	Negative	M	M	M
With Mitigation	M	L	L	Negative	L	M	M
Can the impact be reversed?			YES – the negative effects of construction will cease once construction is complete				
Will impact cause irreplaceable loss or resources?			YES – there will be marginal loss of resources				
Can impact be avoided, managed or mitigated?			YES – mitigation measures can reduce impacts				
Mitigation measures to reduce residual risk or enhance opportunities: - Carefully plan to mimimise the construction period and avoid construction delays. - Minimise vegetation clearing and rehabilitate cleared areas as soon as possible. - Vegetation clearing should take place in a phased manner. - Maintain a neat construction site by removing rubble and waste materials regularly. - Make use of existing gravel access roads where possible. - Limit the number of vehicles and trucks travelling to and from the construction site, where possible. - Unless there are water shortages, ensure that dust suppression techniques are implemented o on all access roads; o in all areas where vegetation clearing has taken place; and o on all soil stockpiles.							

10.8.5 Operational Impacts

Impact Phase: Operation							
Potential impact description: Visual Impacts of the Paulputs WEF • The proposed WEF will alter the visual character of the surrounding area and expose potentially sensitive visual receptor locations to visual impacts. • The development may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. • Dust emissions and dust plumes from maintenance vehicles accessing the site via gravel roads may evoke negative sentiments from surrounding viewers. • The night time visual environment will be altered as a result of operational and security lighting as well as navigational lighting on top of the wind turbines.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	H	Negative	M	H	M
With Mitigation	M	M	M	Negative	M	H	M
Can the impact be reversed?			YES – if any of the WEF is decommissioned				
Will impact cause irreplaceable loss or resources?			YES – there will be a loss of resources				
Can impact be avoided, managed or mitigated?			YES – mitigation measures can reduce impacts				
Mitigation measures to reduce residual risk or enhance opportunities:							

- Where possible, fewer but larger turbines with a greater output should be utilised rather than a larger number of smaller turbines with a lower capacity. - If possible, turbines should be painted plain white, as this is a less industrial colour. Bright colours and logos on the turbines should be kept to a minimum. Where one or more turbine blades are painted in an alternative colour, it is recommended that this colour is restricted to black or grey. - Inoperative turbines should be repaired promptly, as they are considered more visually appealing when the blades are rotating (or at work) (Vissering, 2011). - If turbines need to be replaced for any reason, they should be replaced with the same model, or one of equal height and scale. Repeating elements of the same height, scale and form can result in unity and lessen the visual impact that would typically be experienced in a chaotic landscapes made up of diverse colours, textures and patterns (Vissering, 2011) - Unless there are water shortages, dust suppression techniques are to be implemented on all access roads. - Light fittings for security at night should reflect the light toward the ground and prevent light spill.

Impact Phase: Operation							
Potential impact description: On-site infrastructure associated with the Paulputs WEF • The on-site infrastructure required by the WEF could alter the visual character of the surrounding area and expose sensitive visual receptor locations to visual impacts. • The on-site infrastructure may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. • Dust emissions and dust plumes from maintenance vehicles accessing the site via gravel roads may evoke negative sentiments from surrounding viewers. • The night time visual environment could be altered by operational and security lighting emanating from the on-site substation and the operation and maintenance buildings.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	M	L	Negative	L	L	M
With Mitigation	L	M	L	Negative	L	L	M
Can the impact be reversed?			YES – if any of the WEF is decommissioned				
Will impact cause irreplaceable loss or resources?			YES – there will be marginal loss of resources				
Can impact be avoided, managed or mitigated?			YES – mitigation measures can reduce impacts				
Mitigation measures to reduce residual risk or enhance opportunities: - Light fittings for security at night should reflect the light toward the ground and prevent light spill. - The operation and maintenance buildings should not be illuminated at night. - Where possible, the operation and maintenance buildings should be consolidated to reduce visual clutter. - The operation and maintenance buildings should be painted with natural tones that fit with the surrounding environment. Non-reflective surfaces should be utilised where possible. - Where possible, underground cabling should be utilised. - Unless there are water shortages, dust suppression techniques are to be implemented on all access roads.							

Impact Phase: Operation							
Potential impact description: Grid connection infrastructure associated with the Paulputs WEF • The proposed power line and substation could alter the visual character of the surrounding area and expose sensitive visual receptor locations to visual impacts. • The development may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. • Dust emissions and dust plumes from maintenance vehicles accessing the site via gravel roads may evoke negative sentiments from surrounding viewers. • The night time visual environment could be altered as a result of operational and security lighting at the proposed substation.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	M	L	Negative	L	M	M

With Mitigation	L	M	L	Negative	L	M	M
Can the impact be reversed?	YES – if the power lines are decommissioned						
Will impact cause irreplaceable loss or resources?	YES – there will be marginal loss of resources						
Can impact be avoided, managed or mitigated?	YES – mitigation measures can reduce impacts						
Mitigation measures to reduce residual risk or enhance opportunities: - Where possible, limit the amount of security and operational lighting present at the on-site substation. - Light fittings for security at night should reflect the light toward the ground and prevent light spill. - Where possible, limit the number of maintenance vehicles using access roads. - Non-reflective surfaces should be utilised where possible.							

10.9 Socio-Economic

10.9.1 Construction Impacts

Key potential positive and negative social impacts which can be associated with the construction phase of the proposed Paulputs WEF

Impact Phase: Construction							
Potential impact description: The creation of local employment and business opportunities, and opportunities for skills development and on-site training.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	L	M	Positive	M	M	H
With Mitigation	H	HL	H	Positive	H	H	H
Can the impact be reversed?	Yes, by not developing or implementing the proposed project						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes						
Mitigation measures to reduce residual risk or enhance opportunities: - The project proponent of Paulputs WEF should liaise with the Khâi-Ma and Kai !Garib Local Municipalities to establish a local skills database for the associated areas. The existence of such a skills database should be made available to the contractors before the commencement of the construction phase to establish the extent of the available service providers in the local municipalities. - The key stakeholders, local authorities and the community need to be informed regarding the outcome of the decision of the Paulputs WEF. The potential employment opportunities and the employment procedure that the project proponent intends to follow should be clearly communicated before the commencement of the construction phase. - Reasonable and practical efforts should be made by the project proponent to appoint local contractors by implementing a "locals first" policy. However, due to the technical nature of this project it is likely that skilled positions will be filled by people from outside the local areas. - Efforts should be made to employ local contractors first, and also contractors that are compliant with the Broad Based Black Economic Empowerment (BBBEE) criteria. - The recruitment selection process should also seek to promote gender equality.							

Impact Phase: Construction							
Potential impact description: The potential maximising of opportunities to local and regional SMMEs and other business for service delivery.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**

Without Mitigation	M	L	M	Positive	M	M	H
With Mitigation	H	L	H	Positive	H	H	H
Can the impact be reversed?		Yes, by not developing or implementing the proposed project					
Will impact cause irreplaceable loss or resources?		No					
Can impact be avoided, managed or mitigated?		Yes					

Mitigation measures to reduce residual risk or enhance opportunities:

- The project proponent of Paulputs WEF should liaise with the Khâi-Ma and Kai !Garib Local Municipalities to establish a database for the local companies/service providers of the associated areas. This database should be made available to the contractors before the initiation of the construction phase to notify and invite such service providers to tender for project-based services. However, it should be noted that a competitive tender process may not guarantee the employment of local service providers/companies and this should also be clearly communicated to potential contractors.
- Efforts should be made by the project proponent to assist local Broad Based Black Economic Empowerment (BBBEE) companies regarding the application and submission of tenders.
- Strategies need to be identified by the local municipalities and the local business sectors, in order to maximise the potential benefits which can be associated with the establishment of the Paulputs WEF.

Impact Phase: Construction

Potential impact description: Potential loss of grazing and impact on farming activities associated with the activities of the construction phase

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	M	L	Negative	L	L	H
With Mitigation	L	M	L	Negative	L	L	H
Can the impact be reversed?		Yes, through the rehabilitation of affected / impacted areas.					
Will impact cause irreplaceable loss or resources?		No, however affected areas must be rehabilitated.					
Can impact be avoided, managed or mitigated?		Yes					

Mitigation measures to reduce residual risk or enhance opportunities:

- The soil and agricultural specialist study should be consulted to inform the layout of the wind turbines and its associated infrastructure. Areas of high sensitivity identified in the soil reports should be avoided in the final layout of the turbines.
- In addition, the project proponent should consult with the affected land owners for their inputs and comments on the finalization of the layout of the wind turbines and associated infrastructure, in order for landowners to factor in the construction activities and the impact thereof on their farmlands and farming activities.
- The proposed site for the Paulputs WEF should be clearly demarcated and fenced-off prior to the construction phase. All construction related activities must be confined to this area.
- The footprint of the impact associated with the construction phase need to be kept to the minimum, and sheep need to be relocated to alternative farmlands for the period of the construction phase.
- It is advised that the construction phase take place in two phases and also to start with construction from one part of the site and gradually work the construction thereof through to the other part of the site to ensure that the disturbance to the landowners and their farming activities are kept to the minimum.
- All impacted areas disturbed during the construction phase must be rehabilitated at the end of the construction phase. Rehabilitation plans need to be informed by the soil and agricultural specialist studies.
- An Environmental Control Officer (ECO) must be appointed to continuously monitor the activities associated with the construction phase. The ECO should also apply social monitoring on a quarterly basis and monitor the implementation of the Rehabilitation Programme.

- A Rehabilitation Programme should be implemented by the project proponents. The specifications hereof should be compiled by the appointed EIA practitioners and must be included in the project proponents terms of reference and also be included in the EMPr.
- In the case where a farmer experience permanent loss of farmland due to the construction of the proposed Paulputs WEF, the project proponents should compensate the farmer for the loss of the farmland as in the nature of the agreement made to the affected landowners.

Impact Phase: Construction

Potential impact description: In-migration or potential influx of job seekers which potentially might have impacts on family structures, community and social networks, and basic community services of the Khâi-Ma and Kai !Garib Local Municipalities.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	L	L	Negative	L	M	M
With Mitigation	M	L	L	Negative	L	M	M

Can the impact be reversed?	Yes, by not proceeding with the development or the implementation of the project.
Will impact cause irreplaceable loss or resources?	No, not at a community level.
Can impact be avoided, managed or mitigated?	Yes

Mitigation measures to reduce residual risk or enhance opportunities:

- As stated earlier in this report, the project proponent should implement a "locals first" policy, where the local community of Pofadder and Kakamas should be employed first, specifically for un-skilled and low-skilled employment opportunities.
- The project proponent should implement a policy that no employment opportunities will be available at the gate.
- The proposed construction site for the Paulputs WEF should be clearly fenced off for potential security risks in this regard.
- It should be noted that although the significance of this impact is low, the influx of job seekers can not be avoided or prevented.

Impact Phase: Construction

Potential impact description: The presence of construction workers on-site an in the area on the local communities, on their social networks and on family structures

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	L	M	Negative	M	M	H
With Mitigation	M	L	L	Negative	L	M	H

Can the impact be reversed?	Yes, by not proceeding with the development or the implementation of the project.
Will impact cause irreplaceable loss or resources?	No, not at a community level.
Can impact be avoided, managed or mitigated?	Yes

Mitigation measures to reduce residual risk or enhance opportunities:

- The project proponent and appointed contractors need to develop a code of conduct which must be signed by construction workers prior to the construction phase. The code of conduct should clearly outline the acceptable behaviour and activities of construction workers. In doing so construction workers will be legally informed and held liable for any damages or losses. It is however important that dismissals or fines must comply with the South African labour legislation.

- The proposed site for the Paulputs WEF should be clearly demarcated and fenced off to effectively monitor the movement of construction workers in the vicinity of the project site. - Transportation for the construction workers need to be arranged by the project proponent on a daily basis, and enable the proponent to effectively monitor the movement of construction workers to and from the project site. Where necessary arrangements need to be made by the project proponents to enable construction workers to return to their hometowns over weekends/on a regular basis to reduce the potential risks posed to local family structures and social networks. - No staff should be accommodated over-night on the construction site, except for the presence of security staff throughout the night on site due to security reasons for the landowners and their workers. - HIV/AIDS awareness programmes should be implement by the project proponent for the construction workers during the construction phase.

Impact Phase: Construction							
Potential impact description: Potential safety risk for farmers, risk of livestock theft and farming infrastructure, which are associated with the construction phase and the presence of the workers on the proposed construction site.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	L	M	Negative	M	M	H
With Mitigation	M	L	L	Negative	L	L	H
Can the impact be reversed?			Yes by compensating potential losses that were stolen, and repairing any damages caused.				
Will impact cause irreplaceable loss or resources?			No.				
Can impact be avoided, managed or mitigated?			Yes				
Mitigation measures to reduce residual risk or enhance opportunities: - The proposed construction site for the Paulputs WEF should be clearly fenced off and the movement of construction workers should be limited to the vicinity of the construction site. - The project proponent/ appointed contractors should provide transportation to the construction workers on a daily basis. This will ensure the potential risk regarding the trespassing of construction workers on farmers' properties, be reduced. - No staff should be accommodated over-night on the construction site, except for the presence of security staff throughout the night on site. - The project proponent and appointed contractors need to develop a code of conduct which must be signed by construction workers prior to the construction phase. The code of conduct should clearly outline the acceptable behaviour and activities of construction workers. In doing so construction workers will be legally informed and held liable for any damages/theft. Construction workers found guilty of such an offence should be charged and dismissed. It is however important that dismissals or fines must comply with the South African labour legislation. - The project proponent should enter into an agreement with the farmers prior to the construction phase, whereby the damages/losses to farming property/infrastructure be compensated for, if it can be proven to be associated with the construction activities of the proposed WEF. - The project proponent should hold the appointed contractors liable for the compensation to farmers for any damages or losses that can be associated with the construction phase of the proposed project. This should also be included in the Code of Conduct signed by all key stakeholders. - Procedures regarding waste management on the construction site should be clearly outlined in the Environmental Management Programme (EMPr), to reduce the risk it poses to livestock.							

Impact Phase: Construction							
Potential impact description: The potential impacts of heavy vehicles and construction related activities, damage to roads, and dust pollution.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**

Without Mitigation	M	L	M	Negative	M	M	H
With Mitigation	M	L	L	Negative	L	M	H
Can the impact be reversed?		Yes through the rehabilitation of affected areas.					
Will impact cause irreplaceable loss or resources?		No.					
Can impact be avoided, managed or mitigated?		Yes					

Mitigation measures to reduce residual risk or enhance opportunities:

- Transportation of construction material on the N14 national road to the site should be planned to avoid weekends as well as holiday periods.
- The representatives of the Khâi-Ma and Kai !Garib local municipalities as well as the land owners should be notified in advance the dates and times for when the roads will used for the transportation of abnormal loads.
- Measures for dust suppressions should be implemented on a regular basis to minimize potential dust pollution. Examples of measures include wetting of gravel roads.
- All vehicles related to the construction related activities should adhere to the speed limits.
- Vehicles that are used for the transportation of loose building materials, for example sand, should be fitted with covers to avoid any spillage.
- The appointed contractors should ensure that all vehicles are road-worthy and that the drivers of all vehicles have the relevant licensing documents. Drivers must be made aware of the speed limits and potential road safety issues.
- Appropriate waste management strategies need to be implemented on a regular basis by the contractor for any waste generated during the construction phase and should also be included in the Environmental Management Programme (EMPr).
- The Environmental Management Programme (EMPr) should include measures to be implemented, to ensure that speed limits are adhered to at all times and that gates are closed at all times.
- The contractor must repair any damages to the roads caused by construction related traffic. The costs with regards to the repair of roads must be borne by die contractor.

Impact Phase: Construction

Potential impact description: The increased risk of potential veld fires associated with the construction phase.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	L	M	Negative	M	M	H
With Mitigation	M	L	L	Negative	L	L	H
Can the impact be reversed?		Yes, by compensating potential losses that were caused during the fires, and repairing any damages caused.					
Will impact cause irreplaceable loss or resources?		No.					
Can impact be avoided, managed or mitigated?		Yes					

Mitigation measures to reduce residual risk or enhance opportunities:

- Firebreaks must be implemented by the contractor around the perimeters of the construction site.
- No construction staff should be accommodated on the site over-night except for the presence of security personnel.
- No smoking should be permitted on the site.
- The appointed contractor should ensure that no open fires for the use of cooking or heating should be allowed, except for designated areas.
- Adequate fire-fighting equipment should be provided by the contractors and should be readily available and serviced on a regular basis. Additionally, all staff should be training in fire-fighting and how to use the related fire-fighting equipment.

- The appointed contractors should ensure that any construction related activities that might pose potential fire risks, for example welding and grinding, are confined to the designated areas and that it is properly managed. - The necessary precautionary measures need to be taken during high wind conditions and dry months. - In the event of a fire due to construction related activities, the contractor must repair any damages caused to the farmers. The farmers need to be compensated for any damages caused due to fires borne during construction related activities. The costs with regards to firefighting should also be borne by die contractor. - The project proponent should enter into an agreement with the farmers prior to the construction phase, whereby the damages/losses to farming property/infrastructure due to fire risks be compensated for, if it can be proven to be associated with the construction activities of the proposed WEF.

10.9.2 Operational Impacts

Key potential positive and negative social impacts which can be associated with the operational phase of the proposed Paulputs WEF.

Impact Phase: Operation							
Potential impact description: The creation of local employment and business opportunities, skills development and training which can be associated with the operational phase.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	L	Positive	M	M	H
With Mitigation	M	M	M	Positive	M	H	H
Can the impact be reversed?			Yes, by not proceeding with the implementation project and removing it.				
Will impact cause irreplaceable loss or resources?			No.				
Can impact be avoided, managed or mitigated?			Yes				
Mitigation measures to reduce residual risk or enhance opportunities: - The enhancement measures suggested in the construction phase (see Table 4.2.2) should have already been implemented prior to the implementation phase. - Skills development programmes and training should be provided and implemented to maximise the number of employment opportunities for the local communities of Pofadder and Kakamas. - The project proponent together with the Khâi-Ma and Kai !Garib Local Municipalities should explore the option for establishing a Community Development Trust. - The project proponent and the local municipalities, together with the Tourism Centre, need to explore the possibility of establishing a visitor centre for the proposed project. - The potential opportunities for local content, procurement as well as community shareholding should be explored and maximised.							

Impact Phase: Operation							
Potential impact description: Potential up – and downstream economic opportunities for the community associated with the operational phase.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	L	Positive	M	M	H
With Mitigation	M	M	M	Positive	M	M	H
Can the impact be reversed?			Yes, by not proceeding with the project and removing it.				
Will impact cause irreplaceable loss or resources?			No.				
Can impact be avoided, managed or mitigated?			Yes				

Mitigation measures to reduce residual risk or enhance opportunities:

- The enhancement measures suggested in the construction phase (see Table 4.2.3) should have already been implemented prior to the implementation phase.
- The project proponent together with the Khâi-Ma and Kai !Garib Local Municipalities should explore the option for establishing a Community Development Trust.
- The project proponent and the local municipalities, together with the Tourism Centre, need to explore the possibility of establishing a visitor centre for the proposed project.
- The potential opportunities for local content, procurement as well as community shareholding should be explored and maximised.

Impact Phase: Operation							
Potential impact description: Establishment of renewable energy infrastructure and the generation of clean, renewable energy.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	H	M	Positive	M	M	H
With Mitigation	M	H	H	Positive	H	H	H
Can the impact be reversed?			Yes, by not proceeding with the implementation of the project and removing it.				
Will impact cause irreplaceable loss or resources?			No.				
Can impact be avoided, managed or mitigated?			Yes				

Mitigation measures to reduce residual risk or enhance opportunities:

- The establishment of a renewable energy facility like the proposed Paulputs WEF can be regarded as a mitigation measure itself in terms of the country's high energy demand.
- Training and skills development programmes need to be implemented by the project proponents for the local communities in order to maximise the amount of local people employed during the operational phase.
- Maximise the exposure of the proposed Paulputs WEF to the public through extensive communication, advertisement and the establishment of a visitor centre.
- Utilise the proposed Paulputs WEF to promote and possibly increase South Africa's contributions towards renewable energy to supply the national energy grid.

Impact Phase: Operation							
Potential impact description: Generation of additional income for landowners representing a significant benefit for local affected farmers in the area.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	L	Positive	L	M	H
With Mitigation	M	M	M	Positive	M	H	H
Can the impact be reversed?			Yes, by not proceeding with the project and not implementing agreements with the local farmers.				
Will impact cause irreplaceable loss or resources?			No.				
Can impact be avoided, managed or mitigated?			Yes				

Mitigation measures to reduce residual risk or enhance opportunities:

- Lease agreements between the project proponent and the affected landowners should be implemented.

Impact Phase: Operation

Potential impact description: Benefits associated with the establishment of a Community Trust which is funded from the revenue generated from the sale of energy.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	H	M	Positive	M	M	H
With Mitigation	M	H	H	Positive	H	M	H
Can the impact be reversed?			Yes, by not proceeding with the project and by not implementing agreements.				
Will impact cause irreplaceable loss or resources?			No.				
Can impact be avoided, managed or mitigated?			Yes				
Mitigation measures to reduce residual risk or enhance opportunities: - The potential trustees to sit on a Community Trust need to be identified with the assistance of the Khâi-Ma and Kai !Garib local municipalities. The structure of this trust and the trustees also need to be established to ensure that the Trust is also not mismanaged. - There must be strict financial management controls in place to manage the funds generated for a Community Trust for the proposed Paulputs WEF. Financial management controls that could be implemented can include annual audits. - There should be a clear criteria for the identification and the funding of community projects, for the local communities to optimally benefit from the trust.							

Impact Phase: Operation							
Potential impact description: Visual impact and associated impact on the sense of place associated with the proposed WEF.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	M	L	Negative	L	L	M-H
With Mitigation	L	M	L	Negative	L	L	M-H
Can the impact be reversed?			Yes, by not proceeding with the project and removing the WEF.				
Will impact cause irreplaceable loss or resources?			Yes, there will be a marginal loss of resources.				
Can impact be avoided, managed or mitigated?			Yes				
Mitigation measures to reduce residual risk or enhance opportunities: - The recommendations contained in the Visual Impact Assessment (VIA) report should be consulted and implemented during the operational phase. The measures aimed at addressing the impact of aviation lights at night should specifically also be addressed.							

Impact Phase: Operation							
Potential impact description: Potential impact on tourism due to the establishment of the proposed WEF.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	L	Negative	L	M	H
With Mitigation	M	M	L	Negative	L	M	H
Can the impact be reversed?			Yes, by not proceeding with the project and removing the WEF.				

Will impact cause irreplaceable loss or resources?	No.
Can impact be avoided, managed or mitigated?	Yes
Mitigation measures to reduce residual risk or enhance opportunities: - The recommendations contained in the Visual Impact Assessment (VIA) report should be consulted and implemented during the operational phase. - The project proponents should also consider the establishment of a visitor centre for the proposed Paulputs WEF.	

10.9.3 Decommissioning Impacts

Key potential social impacts which can be associated with the decommissioning phase of the proposed Paulputs WEF.

Impact Phase: Decommissioning							
Potential impact description: Potential loss of employment opportunities and associated income due to the decommissioning of the proposed WEF.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	M	Negative	M	M	H
With Mitigation	M	L	L	Negative	L	M	H
Can the impact be reversed?	Yes, by not proceeding with the project and removing the WEF.						
Will impact cause irreplaceable loss or resources?	No.						
Can impact be avoided, managed or mitigated?	Yes						
Mitigation measures to reduce residual risk or enhance opportunities: - Retrenchment packages should be provided to all staff when the Paulputs WEF is decommissioned and must be included in their contracts and communicated in advance. - An Environmental Rehabilitation Trust Fund should be established to cover all the costs associated with the decommissioning phase and the rehabilitation of the affected/ impacted areas. Funds should be funded by a percentage of the revenue generated from the sale of the energy to the national grid over the lifespan (20–25 years) of the WEF. - All related infrastructures associated with the proposed Paulputs WEF should be dismantled and transported off-site.							

10.10 Traffic and Transportation

10.10.1 Construction Impacts

Impact Phase: Construction							
Potential impact description: Storage of Cargo Cargo (machinery, equipment, etc.) off-loaded at Saldanha Port will need to be transported to a holding area (storage facility) close to Saldanha Port, before being transported to site.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	L	H	Negative	M	M	M
With Mitigation	L	L	H	Negative	L	L	M
Can the impact be reversed?	Yes						
Will impact cause irreplaceable loss or resources?	No						

Can impact be avoided, managed or mitigated?	Yes, impacts can be managed and mitigated.
Mitigation measures to reduce residual risk or enhance opportunities: This should form part of the Transport Management Plan: - Provide a holding facility for cargo, close to Saldanha Port, to prevent unnecessary travel on the road network and to limit associated traffic loading to roads in close proximity to Saldanha Port.	

Impact Phase: Construction							
Potential impact description: Route Constraints Constraints for super-load vehicles en-route to site could result in unacceptable traffic impact (compromised road safety and increased traffic congestion). Super-load (extra-long, low or tall vehicles exceeding abnormal load vehicle dimensional and mass limitations as defined in TRH11) will experience constraints along the chosen route, i.e. inadequate space to accommodate vehicle turning movements at R27 interchange under construction, spatial constraints at various intersections due to intersection geometry and street furniture (i.e. R27 / R399 intersection, R399 / N7 intersection, N7 traffic roundabout at Piketberg, N7/R355 and R355/N14 and N14 Voortrekker Road (N14) intersections and N14/MR759 intersection), tight horizontal curves on R399 and on N7 in Piekenierskloof Pass might be inadequate for very long vehicles (transporting turbine blades and other) resulting in abnormally long vehicles centre-line tracking (encroaching into the opposing lane), no suitable roads exist on-site to access Wind Turbine locations.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	H	L	H	Negative	H	H	H
With Mitigation	H	L	L	Negative	M	L	H
Can the impact be reversed?	Yes						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes, impacts can be managed and mitigated.						
Mitigation measures to reduce residual risk or enhance opportunities: - Implement an approved Transportation Plan to ensure safe transport of materials and equipment to site.							

Impact Phase: Construction							
Potential impact description: Traffic Congestion Traffic congestion, impedance to traffic flow due to increase in traffic volumes en-route to site.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	H	L	M	Negative	M	M	M
With Mitigation	H	L	M	Negative	L	L	M
Can the impact be reversed?	Yes						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes, impacts can be managed and mitigated.						
Mitigation measures to reduce residual risk or enhance opportunities: - Implement approved Traffic Management Plan and approved Transportation Plan to ensure safe transport of materials, equipment, etc. to site and to limit traffic congestion.							

Impact Phase: Construction

Potential impact description: Intersection Safety Additional traffic at the M14/MR759 intersection and at the MR759/Paulputs Site Access increases risk of vehicle crashes.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	L	H	Negative	M	H	M
With Mitigation	L	L	H	Negative	M	M	M
Can the impact be reversed?			Yes				
Will impact cause irreplaceable loss or resources?			No				
Can impact be avoided, managed or mitigated?			Yes, impacts can be managed and mitigated.				
Mitigation measures to reduce residual risk or enhance opportunities: - Implement approved Traffic Management Plan to ensure safe access to site from the N14.							

Impact Phase: Construction							
Potential impact description: Safety on site (Grid) Whether laying cables underground or installing pylons and overhead lines, where the grid construction activities overlap with the WEF construction activities/work zones on-site, there is risk of vehicle crashes with workers in the work zone.							
Grid Option 1							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	L	H	Negative	M	M	M
With Mitigation	L	L	H	Negative	L	L	M
Can the impact be reversed?			Yes				
Will impact cause irreplaceable loss or resources?			No				
Can impact be avoided, managed or mitigated?			Managed				
Mitigation measures to reduce residual risk or enhance opportunities: - Implement approved Traffic Management Plan.							

Impact Phase: Construction							
Potential impact description: N14 Safety (Grid) Grid build on WEF site south of the N14 will entail the Grid crossing the N14 with potential risk of vehicle crashes during installation. Where installing pylons and overhead lines, there is risk of vehicles crashing into equipment or people in the work zone where the Grid construction activities extend into the N14 road reserve.							
Grid Option 1							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	L	H	Negative	M	M	M
With Mitigation	L	L	H	Negative	L	L	M
Can the impact be reversed?			Yes				
Will impact cause irreplaceable loss or resources?			No				

Can impact be avoided, managed or mitigated?	Managed
Mitigation measures to reduce residual risk or enhance opportunities: - Obtain wayleaves and adhere to safety requirements when working in the N14 road reserve, (i.e. temporarily close road to traffic, ideally when traffic flow is low (i.e. weekend, off-peak) with approval of road authorities and with assistance of traffic law enforcement).	

Impact Phase: Construction							
Potential impact description: Intersection Safety (Grid) Additional traffic at the M14/MR759 intersection and at the MR759/Paulputs Site Access increases risk of vehicle crashes.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	L	H	Negative	M	M	M
With Mitigation	L	L	H	Negative	L	L	M
Can the impact be reversed?	Yes						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes, impacts can be managed and mitigated.						
Mitigation measures to reduce residual risk or enhance opportunities: - Implement approved Traffic Management Plan to ensure safe access to site from the N14.							

10.10.2 Operational Impacts

Impact Phase: Operation							
Potential impact description: Route constraints Constraints for abnormal load vehicles carrying certain replacement parts (i.e. new wind turbine blade) could result in unacceptable traffic impact (road safety and traffic congestion).							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	H	H	H	Negative	H	M	M
With Mitigation	H	H	L	Negative	M	M	M
Can the impact be reversed?	Yes						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes, impacts can be managed and mitigated.						
Mitigation measures to reduce residual risk or enhance opportunities: - Implement approved Transportation Plan to ensure safe transportation of materials and equipment to site.							

Impact Phase: Operation							
Potential impact description: Intersection safety Additional traffic to the site increases the risk of vehicle crashes at the WEF sites accesses to the N14.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	H	Negative	H	M	M

With Mitigation	L	H	H	Negative	M	L	M
Can the impact be reversed?			Yes				
Will impact cause irreplaceable loss or resources?			No				
Can impact be avoided, managed or mitigated?			Yes, impacts can be managed and mitigated.				
Mitigation measures to reduce residual risk or enhance opportunities: - Implement approved Traffic Management Plan to ensure safe access to sites from the N14.							

Impact Phase: Operation							
Potential impact description: Negligible Impacts (Grid) Very low vehicle trip generation with Negligible Impacts							
Grid Option 1							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	L	H	Negative	L	L	M
With Mitigation	n/a	n/a	n/a	Negative	n/a	n/a	n/a
Can the impact be reversed?			Yes				
Will impact cause irreplaceable loss or resources?			No				
Can impact be avoided, managed or mitigated?			No impacts.				
Mitigation measures to reduce residual risk or enhance opportunities: - There are no impacts requiring mitigation.							

10.10.3 Decommissioning Impacts

Impact Phase: Decommissioning							
Potential impact description: Intersection safety Additional traffic to the site increases the risk of vehicle crashes at the WEF sites accesses to the N14.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	L	H	Negative	M	H	M
With Mitigation	L	L	H	Negative	M	M	M
Can the impact be reversed?			Yes				
Will impact cause irreplaceable loss or resources?			No				
Can impact be avoided, managed or mitigated?			Yes, impacts can be managed and mitigated.				
Mitigation measures to reduce residual risk or enhance opportunities: - Implement approved Traffic Management Plan to ensure safe access to site from the N14.							

Impact Phase: Decommissioning
Potential impact description: Intersection Safety (Grid) Additional heavy vehicle traffic at the M14/MR759 intersection and at the MR759/Paulputs Site Access increases risk of vehicle crashes.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	L	L	H	Negative	M	M	M
With Mitigation	L	L	H	Negative	L	L	M
Can the impact be reversed?	Yes						
Will impact cause irreplaceable loss or resources?	No						
Can impact be avoided, managed or mitigated?	Yes, impacts can be managed and mitigated.						
Mitigation measures to reduce residual risk or enhance opportunities: - Implement approved Traffic Management Plan to ensure safe access to site from the N14.							

11 CUMULATIVE IMPACTS

11.1 Geology, Soils and Agriculture

The potential cumulative agricultural impact of importance is a regional loss or degradation of agricultural land. The defining question for assessing the cumulative agricultural impact is this that what level of loss of agricultural land use is acceptable in the area, and will the loss associated with the electrical transmission lines of the Paulputs PV development, cause that level in the area to be exceeded.

The area of land taken out of agricultural grazing as a result of all cumulatively assessed projects will amount to a total of approximately 2,500 hectares. As a proportion of the area within a 35 km radius (approximately 385,000 ha), this amounts to only 0.65% of the surface area. That is well within an acceptable limit in terms of loss of very low potential agricultural land, of which there is no scarcity. This is particularly so when considered within the context of the following two points:

- In order for South Africa to achieve its renewable energy generation goals, agriculturally zoned land will need to be used for renewable energy generation. It is far more preferable to incur a cumulative loss of agricultural land in a region such as the one being assessed, which has no cultivation potential, and low grazing capacity, than to lose agricultural land that has a higher potential, and that is much scarcer, to renewable energy development elsewhere in the country. The limits of acceptable agricultural land loss are therefore far higher in this region than in regions with higher agricultural potential.
- It is also preferable, from an impact point of view as well as from practical considerations, to rather have a concentrated node of renewable energy development within one area, than to spread out the same number of developments over a larger area. Therefore, if the cumulative impact is considered only for the node, it leads to a false impression of the magnitude of that impact because of the concentrated development within the node, and the absence of development surrounding it. When averaged over a greater area, the magnitude becomes much less.

It should also be noted that there are few land uses, other than renewable energy, that are competing for agricultural land use in this area. The cumulative impact from developments, other than renewable energy, is therefore low.

Due to all of the considerations discussed above, the cumulative impact of loss and degradation of agricultural land use is assessed as having low significance. In terms of cumulative impact, therefore, the development can be authorised.

There is a relatively low risk of significant soil degradation resulting from renewable developments in the vicinity of the study area. This is because erosion risk of the environment is relatively low (see Section 6.3), the kind of activities associated with renewable energy developments, do not pose a high erosion risk, and erosion is fairly easy to manage within such a development. Degradation is therefore not considered a significant cumulative impact.

Impact Phase: Construction/ Operation/ Decommissioning							
Potential impact description: Regional loss of agricultural land use. Agricultural grazing land directly occupied by the development infrastructure, which includes roads and hardstands, will become unavailable for agricultural use. However, only a very small proportion of the total land surface is impacted in this way.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	M	L	Negative	L	L	H
With Mitigation	L	M	L	Negative	L	L	H
Can the impact be reversed?			Yes, once the wind farm is decommissioned, the footprint of the infrastructure can again be utilised as grazing land.				
Will impact cause irreplaceable loss or resources?			No, because only a very small amount of grazing land is lost and such land is not a scarce resource.				
Can impact be avoided, managed or mitigated?			No				
Mitigation measures to reduce residual risk or enhance opportunities: - None							
Impact to be addressed/ further investigated and assessed in Impact Assessment Phase?				No further assessment is required as a fully comprehensive and entirely adequate assessment has been completed in this scoping phase			

11.2 Aquatic

In the assessment of this project, a number of projects have been assessed by the report author within a 35km radius have been reviewed and or sites accessed during the course of travelling between the various projects. Of these potential projects, the aquatic specialist has been involved in the initial EIA aquatic assessments or has managed / assisted with the WUL process for several of the projects. 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 the cumulative impact could be seen as a net benefit.

Impact Phase: Construction/ Operation/Decommissioning							
Potential impact description: Impact 6 – Overall cumulative impact. The worse-case scenario has been assessed below, i.e. only the minimum of mitigation be implemented by the other projects, and that flows within these systems are sporadic							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	M	Negative	M	M	High
With Mitigation	L	L	L	Negative	L	L	L
Can the impact be reversed?			Yes – due to the nature of the projects and surrounding aquatic ecosystems				
Will impact cause irreplaceable loss or resources?			No				

Can impact be avoided, managed or mitigated?	Yes – see list below
Mitigation measures to reduce residual risk or enhance opportunities: - 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	

11.3 Flora and Terrestrial Fauna

There are several other existing renewable energy developments in broader proximity to the current site. This includes the Biotherm 20MW Konkoonies PV plant northwest of the site as well as the two CSP plants west of Paulputs Substation. As these already existing and operational, they are considered to form part of the transformation baseline for the area. The footprint of these existing plants is approximately 800ha. There is also the larger 75MW PV plant on Konkoonsies that is a preferred bidder and is currently under construction and would have a footprint of approximately 200ha. The total existing footprint of renewable energy in the area is thus approximately 1000ha. The Juwi Paulputs PV project also recently received authorisation and consists of 3x100MW PV plants which would occupy approximately 600ha in total. Thus, there is an additional potential 600ha of development around the Paulputs Substation that would potentially be built in the future. It is clear that a node of wind and solar energy development is starting to develop around the Paulputs Substation. However, the wider surrounding landscape is still overwhelmingly intact and has experienced little other transformation to date.

The contribution of the current development to direct habitat loss would be less than 150ha and given the extensive nature of the receiving landscape, this additional habitat loss is not considered highly significant. While the broader landscape is still little-impacted by transformation, the concentration of development around the substation is a potential concern. However, the impact of the current development on the more sensitive features of the area, in particular the dune systems, quartz areas and rocky hills has been minimised. The overall cumulative impacts associated with the current development are considered to be acceptable and of low significance.

Impact Phase: Cumulative							
Potential impact description: Habitat loss and impact on broad-scale ecological processes There are several other renewable energy developments in the wider area and along with the current development, these would potentially generate significant cumulative impacts on habitat loss and fragmentation and negative impact on broad-scale ecological processes such as dispersal and climate change resilience. While there are several existing and proposed renewable energy developments in the wider area (within 100km), those in closer proximity (within 30km) to the site are seen as the most important with regards to generating cumulative impact. The current footprint in the area stands at around 1000ha. Although a node of development is concentrating around the Paulputs substation, even with the current and other proposed developments, the overall extent of development in the wider area is still low and currently impacts on broad scale ecological processes are likely to remain low as the areas that are likely to be important for the maintenance of broad-scale ecological processes such as dispersal remain free of development.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
WEF							
Without Mitigation	M	H	M	Negative	M	H	H
With Mitigation	L	H	L	Negative	L	M	H
Grid Connection							
Without Mitigation	L	H	M	Negative	L	M	H
With Mitigation	L	H	L	Negative	L	M	H

Can the impact be reversed?	No. Habitat loss and disturbance will persist for the lifetime of the facility.
Will impact cause irreplaceable loss or resources?	No. No species or habitats of high conservation concern are likely to be compromised by the development.
Can impact be avoided, managed or mitigated?	Partly. Sensitive habitats can be avoided, but some contribution to cumulative impact in the area is inevitable and cannot be fully avoided or mitigated.
Mitigation measures to reduce residual risk or enhance opportunities: - Avoid impact to restricted and specialised habitats such as quartz patches and rocky outcrops. - Minimise the development footprint as far as possible and ensure that the management plans for the facility are optimally implemented during the operational phase of the development to ensure that the indirect impacts associated with the development are kept to a minimum.	

11.4 Avifauna

Proposed or approved developments within 50 km of the site boundary were identified using the DEA's latest available spatial layer of renewable energy applications (Q1_2019), and included 13 solar projects for consideration in the cumulative assessments. It is unlikely that all these projects will be built and therefore our assessment assumed that up to 9 of these projects would be built (including the three in operation). There are no planned or existing wind farms within 35 km of the proposed Paulputs WEF. Two existing CSP trough plants are in operation (KaXu Solar One and !Xina Solar One) as well as one operational solar PV and another being preferred bidder. No operational monitoring data are available for any of the operational facilities. One 200 MW CSP tower plant has been approved which poses a particular threat to birds, as they incinerate when flying too close to the heated collection tower. While some birds may collide with the CSP troughs mistaking them for a surface water, collisions for this technology are generally unlikely.

The cumulative impact of habitat loss to certain local species, in particular Martial Eagle may become a potentially significant impact to note, due to the large footprints of the planned and constructed solar facilities. The contribution of the proposed Paulputs WEF to this is impact is however minor, as a wind energy facilities footprint only occupies 2 – 5% of the actual site. A knock-on effect of this may be an increased risk of collision, particularly by Martial Eagle, as habitat near the Martial Eagle nest becomes unavailable (due to possible construction of PV facilities) for eagles to utilise, and this could potentially increase their foraging effort on the WEF site.

Any publically available specialist, EIA or BA reports were obtained and reviewed in terms of avifaunal impacts, and included in the cumulative assessment.

Impact Phase: Construction/ Operation/ Decommissioning							
Potential impact description: The main cumulative threat to birds in the area is expected to be from habitat loss and powerline collisions, as each of the proposed facilities will require a grid connection to the Paulputs substation. This impact is only partially mitigatable, and only if all new overhead powerlines are fitted with BFD markers and are of a bird friendly design.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	H	M	H	Negative	H	M	H
With Mitigation	H	M	H	Negative	M	M	M
Can the impact be reversed?	Yes						
Will impact cause irreplaceable loss or resources?	No						

Can impact be avoided, managed or mitigated?	Yes
Mitigation measures to reduce residual risk or enhance opportunities: - All mitigation measures listed above and recommended for other projects must be adhered to. - The applicant and/or operational project company should proactively collaborate with other renewable energy operators in the area. Operational monitoring data must be shared with Birdlife SA.	

11.5 Bats

The cumulative impact on bats was considered by searching for current and potential future development of wind energy facilities within a 50 km of the project. There are no wind energy facilities, planned or approved, within this radius based on the Department of Environmental Affairs Renewable Energy Development Database Quarter One 2019. The closest wind energy facility is the Namies Wind Farm, approximately 57 km south west.

It is important to consider cumulative impacts across the entire scale potentially affected animals are likely to move, especially mobile animals like bats. Impacts at a local scale could have negative consequences at larger scales if the movement between distant populations is impacted (Lehnert et al. 2014; Voigt et al. 2012). For example, Lehnert et al. (2014) demonstrated that among Noctule bats collected beneath wind turbines in eastern Germany, 28 % originated from distant populations in the Northern and North-eastern parts of Europe. This is particularly relevant to bats that migrate. One migratory bat was recorded on the site but relatively seldom so a larger cumulative impact area was not considered at this stage.

The cumulative impacts could be lower for species that do not migrate over such large distances or resident species that are not known to migrate. Five of the six species recorded during the pre-construction monitoring do not migrate over such large distances. The sphere of the cumulative impact would then likely be restricted to the home ranges and foraging distances of different species, which can range from 1 km to at least 15 km for some insectivorous bats (Jacobs and Barclay 2009; Serra-Cobo and Sanz-Trullen 1998) and up to at least 24 km for some fruit bats (Jacobsen et al. 1986).

Cumulative impacts on bats could increase as new facilities are constructed (Kunz et al. 2007b) but are difficult to accurately predict or assess without baseline data on bat population size and demographics (Arnett et al. 2011; Kunz et al. 2007b) and these data are lacking for many South African bat species. It is possible that cumulative impacts could be mitigated with the appropriate measures applied to wind farm design and operation. Cumulative impacts could result in declines in populations of even those species of bats currently listed as Least Concern, if they happen to be more susceptible to mortality from wind turbines (e.g. high-flying open air foragers such as free-tailed and fruit bats) even if the appropriate mitigation measures are applied. Further research into the populations and behaviour of South African bats, both in areas with and without wind turbines, is needed to better inform future assessments of the cumulative effects of WEFs on bats.

Impact Phase: Cumulative
Potential impact description: Bat Mortality Impacts
Cumulative indirect impacts to bats, such as those relating to changes to the physical environment (e.g. roost and habitat destruction) are likely to be low across the cumulative impact regions. Cumulative direct impacts to bats, specifically those related to bat mortality, are likely to be higher. For non-migratory species cumulative direct impacts could have a medium or high significance before mitigation but could reduce to medium or low with appropriate turbine siting and operational mitigation if determined as being necessary based on operational monitoring. Direct impacts on migratory species (i.e. the Natal long-fingered bat) may be high before mitigation but could also reduce to low or medium with appropriate turbine siting and operational mitigation. However, these ratings would be dependent on all other surrounding wind energy facilities also adopting similar mitigation strategies to reduce impacts to bats.

There are no operational wind energy facilities in the cumulative impact area, and thus currently impacts to bats are negligible. Pre-construction monitoring at the Namies Wind Farm rated impacts to bats as low with mitigation[21]. However, pre-construction monitoring data of bat activity are not a good predictor of the impacts that may be expected at operational wind farms (Hein et al. 2013), limiting their use in understanding and predicting cumulative impacts. However, because of a lack of published data on the impact of wind energy facilities on bats in South Africa, and limited baseline data on bat population size and demographics, the confidence in this assessment is medium.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	H	H	M	Negative	M	L	M
With Mitigation	H	H	L	Negative	L	L	M
Can the impact be reversed?	No						
Will impact cause irreplaceable loss or resources?	Yes						
Can impact be avoided, managed or mitigated?	Yes						
Mitigation measures to reduce residual risk or enhance opportunities: - At operational wind energy facilities where impacts to bats are high, or exceed threshold values[22], mitigation strategies such as curtailment or deterrents must be used. - The operation of lights at substations should be limited to avoid attracting bats to the area. Where lights need to be used such as at the substation and switching station and elsewhere, these should have low attractiveness for insects such as low pressure sodium and warm white LED lights (Rydell 1992; Stone 2012). High pressure sodium and white mercury lighting is attractive to insects (Blake et al. 1994; Rydell 1992; Svensson & Rydell 1998) and should not be used as far as possible. - Lighting should be fitted with movement sensors to limit illumination and light spill, and the overall lit time. In addition, the upward spread of light near to and above the horizontal plane should be restricted and directed to minimise light trespass and sky glow. - Increasing the spacing between lights, and the height of light units can reduce the intensity and volume of the light to minimise the area illuminated and give bats an opportunity to fly in relatively dark areas between and over lights.							
Impact to be addressed/ further investigated and assessed in Impact Assessment Phase?	Yes, additional acoustic monitoring data and a site visit will be used to assess risk to bats.						

11.6 Noise

A search has been carried out for other wind energy developments (WEDs) that may require to be included within a cumulative assessment.

On the basis that SANS 10328 recommends assessment of the noise effects of an individual wind energy development where it is to be constructed within 2 km of a noise-sensitive development, it is therefore considered that a cumulative effects assessment is required where:

- Another wind energy development is to be constructed within 4 km of the Development.

No permitted wind energy developments have been identified within 4 km of the Development, therefore cumulative effects do not require further consideration.

[21] Only the EA Amendment report for this project could be located and this report did not describe the pre-mitigation impact rating for bats, nor the mitigation requirements for bats for this project.

[22] MacEwan, K., Aronson, J., Richardson, E., Taylor, P., Coverdale, B., Jacobs, D., Leeuwner, L., Marais, W., Richards, L. 2018. South African Bat Fatality Threshold Guidelines for Operational Wind Energy Facilities – ed 2. South African Bat Assessment Association.

11.7 Heritage, Archaeology and Palaeontology

11.7.1 Cumulative impacts to archaeology and graves

Cumulative impacts to archaeological resources and graves would occur during the construction phase when the ground surface is disturbed when vegetation is cleared and foundations are excavated. These would be direct impacts. In this relatively arid environment archaeological resources tend to occur in close proximity to water sources and to rocky outcrops and hills. These are areas typically protected from development which means that cumulative impacts are of limited concern in terms of archaeology. Furthermore, mitigation of archaeological sites is easily effected which means that the cultural significance of the archaeology is largely retained. Together these factors determine a low intensity of cumulative impacts to archaeology in this general area. The kinds of sites likely to be found are of local heritage significance so the extent of impacts would be local. Impacts to archaeological resources are destructive and hence permanent but the probability of impacts occurring is deemed to be low because of the efforts generally made (including by the present developer) to avoid pans, rock outcrops and rocky hills which are the most sensitive parts of the broader landscape. The locations of graves cannot be predicted and they are very rarely encountered. The overall impact significance before mitigation is thus likely to be low. Pre-construction archaeological surveys within the authorised footprints of renewable energy developments would identify any issues and recommend mitigation as may be required. Although there is a low probability of sites being found, the chances are not zero and some significant sites have been found and mitigated in this way (Orton 2016a). The intensity of impacts would remain low and the impact significance after mitigation would be low. Overall, cumulative impacts to archaeology and graves are of little concern and there are no fatal flaws.

Impact Phase: Cumulative							
Potential impact description: Impacts to archaeological resources and graves Archaeological resources on the ground (artefacts, occupation debris) and graves can be damaged and/or destroyed during construction activities.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	L	Negative	L	L	H
With Mitigation	L	H	L	Negative	L	L	H
Can the impact be reversed?			No				
Will impact cause irreplaceable loss or resources?			Yes				
Can impact be avoided, managed or mitigated?			Yes, archaeological mitigation can be easily implemented. Graves can be exhumed and/or relocated.				
Mitigation measures to reduce residual risk or enhance opportunities: - Commission pre-construction archaeological surveys to check the actual footprint of the developments. Such surveys would identify any sites that require mitigation. - Protect and report any graves or dense concentrations of artefacts found during vegetation clearing or excavation of foundations.							

11.7.2 Cumulative impacts to palaeontology

Cumulative impacts to palaeontological resources could occur during the construction phase. The chances of fossils being found in the broader area are very low because the nature of the geology is generally not conducive to fossils being present. The majority would likely be associated with alluvial deposits along water courses which are generally excluded from development. It remains possible, however, that rare, isolated bones might be present and could be damaged or destroyed during construction activities. Because of the rarity of such finds, the great difficulty in spotting them during excavation and consequent low likelihood that they would be reported and rescued, the impact intensity could be medium. Destruction of fossils is permanent but the chances of this occurring are generally very low. Before mitigation the impacts are likely to be of low significance. Post-mitigation significance remains at the low level. There are no fatal flaws in terms of cumulative impacts to palaeontological resources.

Impact Phase: Cumulative							
Potential impact description: Impacts to paleontological resources Paleontological resources in the ground (fossil bones) can be damaged and/or destroyed during construction activities.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	M	Negative	L	L	H
With Mitigation	L	H	L	Negative	L	L	H
Can the impact be reversed?			No				
Will impact cause irreplaceable loss or resources?			Yes				
Can impact be avoided, managed or mitigated?			Yes, paleontological mitigation can be implemented but the chances of it being effective are limited.				
Mitigation measures to reduce residual risk or enhance opportunities: - Protect and report any fossil bones found during vegetation clearing or excavation of foundations.							

11.7.3 Cumulative impacts to cultural landscape

The cultural landscape and N14 traversing it would be impacted during all stages of the development since it is the presence of the infrastructure and associated construction equipment (industrial character) within the rural/natural landscape that results in impacts. Although not within a Renewable Energy Development Zone, several solar energy facilities, substations and power lines are already present in the area and it is seen as desirable to cluster such facilities in the landscape rather than spreading them out. Although the industrial nature of renewable energy facilities and electrical infrastructure is distinctly different to the surrounding landscape, the landscape is large and can likely absorb these developments, especially if they are kept in a cluster. Because they are generally lower to the ground and merge with the landscape when seen from afar, the solar energy facilities result in less cumulative impacts than WEFs do. The intensity of impacts is thus likely to be medium. The impacts will be of local extent because they are clustered but, if construction goes ahead, they would definitely occur. The significance of impacts before mitigation is likely to be medium. Because mitigation cannot hide the facilities, the significance of impacts after mitigation remains medium. There are no fatal flaws in terms of cumulative impacts to the cultural landscape.

Impact Phase: Cumulative							
Potential impact description: Impacts to the cultural landscape The rural/natural landscape is affected by the visual intrusion into it of electrical infrastructure and construction equipment and machinery.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	M	Negative	M	H	H
With Mitigation	L	H	M	Negative	M	H	H

Can the impact be reversed?	Yes
Will impact cause irreplaceable loss or resources?	No
Can impact be avoided, managed or mitigated?	No, but minor visual mitigation measures should still be applied as best practice.
Mitigation measures to reduce residual risk or enhance opportunities: - Cluster renewable energy facilities and related infrastructure; - Ensure effective rehabilitation of areas not required during operation (e.g. temporary laydown areas); - Minimise lighting; and - Any other best practice visual mitigation measures suggested by the visual specialist.	

11.8 Visual

Eleven renewable energy projects were identified within a 35 km radius of the proposed Paulputs WEF and grid connection infrastructure. All of these projects are Solar Energy facilities (SEFs) and as such are expected to have different impacts when compared to WEF projects. These renewable energy developments are however relevant as they influence the cumulative visual impact of the proposed development.

Four of the SEFs identified are concentrated some 30kms to the north of the application site, close to the Orange River. These projects are therefore well outside the visual assessment zone for this study and although the introduction of an increasingly industrial character into the broader area is inevitable, it is not anticipated that these developments will result in any significant cumulative impacts affecting the landscape or the visual receptors within the visual assessment zone. The remaining seven projects are however located within the 10km visual assessment zone for the Paulputs project, and three of these, namely KaXu Solar One SEF, !Xina Solar One and Konkoonsies SEF are in operation. It is believed that construction on the Konkoonsies II SEF has recently commenced. All eleven projects are concentrated in close proximity to Paulputs substation and the surrounding landscape has already undergone noticeable change, which will be exacerbated with the development of a WEF in the area as proposed. Impacts of this transformation will however be reduced by the fact the landscape in the vicinity of the proposed WEF development has already been disturbed by the Paulputs substation and the existing high voltage power lines feeding into it.

Two projects (KaXu solar One and !Xina Solar One) are CSPs, while the Konkoonsies projects and the Paulputs PV projects are all Solar Photovoltaic (PV) facilities. The CSPs, which both use parabolic trough technology with a central power plant, are significantly larger and more prominent facilities than the nearby PV facilities. Although the parabolic troughs can reach a height of 8m, these structures, are considerably less visible than wind turbines and as such the SEF developments would be outside the viewing distance of most of the potentially sensitive receptor locations identified in the study area. Cumulative impacts affecting these receptors would therefore be reduced and the severity of these impacts would depend on the perceptions of the receptors.

The further concentration of renewable energy facilities proposed will inevitably change the visual character of the area and alter the inherent sense of place, introducing an increasingly industrial character into a largely natural area, and thus giving rise to significant cumulative impacts. It is however anticipated that these impacts could be mitigated to acceptable levels with the implementation of the recommendations and mitigation measures put forward by the visual specialists in their respective reports.

Impact Phase: Cumulative Construction
Potential impact description: Cumulative Construction

- Large construction vehicles and equipment associated with nearby renewable energy developments will alter the natural character of the study area and expose a greater number of visual receptors to impacts associated with construction.
- Visual intrusion of the additional construction activities may be exacerbated, particularly in more natural undisturbed settings.
- Additional construction activities in the area would generate additional traffic on gravel roads in the area thus resulting in increased impacts from dust emissions and dust plumes.
- Additional areas of visual contrast may occur as a result of surface disturbance at other renewable energy construction sites. Further alteration of the landscape and increased dust emissions could occur as a result of temporary stockpiling of soil at other renewable energy construction sites.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	M	M	Negative	M	M	L
With Mitigation	M	M	M	Negative	M	M	L

Can the impact be reversed?	YES – The impact is partly reversible. The negative effects of construction will cease once construction is complete
Will impact cause irreplaceable loss or resources?	YES – there will be some loss of resources
Can impact be avoided, managed or mitigated?	YES – mitigation measures can reduce impacts

Mitigation measures to reduce residual risk or enhance opportunities:

- Carefully plan to mimimise the construction period and avoid construction delays.
- Minimise vegetation clearing and rehabilitate cleared areas as soon as possible.
- Vegetation clearing should take place in a phased manner.
- Maintain a neat construction site by removing rubble and waste materials regularly.
- Make use of existing gravel access roads where possible.
- Limit the number of vehicles and trucks travelling to and from the proposed sites, where possible.
- Where possible, ensure that dust suppression techniques are implemented
  - on all access roads;
  - in all areas where vegetation clearing has taken place; and
  - on all soil stockpiles.

Impact Phase: Cumulative Operation

Potential impact description: Cumulative Operation

- Additional renewable energy developments in the broader area will alter the natural character of the study area towards a more industrial landscape and expose a greater number of receptors to visual impacts.
- Visual intrusion of multiple renewable energy developments may be exacerbated, particularly in more natural undisturbed settings.
- Additional renewable energy facilities in the area would generate additional traffic on gravel roads thus resulting in increased impacts from dust emissions and dust plumes.
- The night time visual environment could be altered as a result of operational and security lighting at multiple renewable energy facilities in the broader area.

	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Without Mitigation	M	M	M	Negative	M	M	M
With Mitigation	M	M	M	Negative	M	M	M

Can the impact be reversed?	YES – if any of the WEF and associated power lines are decommissioned
Will impact cause irreplaceable loss or resources?	YES – there will be marginal loss of resources
Can impact be avoided, managed or mitigated?	YES – mitigation measures can reduce impacts

Mitigation measures to reduce residual risk or enhance opportunities: - Where possible, fewer but larger turbines with a greater output should be utilised rather than a larger number of smaller turbines with a lower capacity. - If possible, turbines should be painted plain white, as this is a less industrial colour. Bright colours and logos on the turbines should be kept to a minimum. Where one or more turbine blades are painted in an alternative colour (in accordance with the recommendations of the avifaunal specialist), it is recommended that this colour is restricted to black or grey. - Inoperative turbines should be repaired promptly, as they are considered more visually appealing when the blades are rotating (or at work). - If turbines need to be replaced for any reason, they should be replaced with the same model, or one of equal height and scale, where possible. Repeating elements of the same height, scale and form can result in unity and lessen the visual impact that would typically be experienced in a chaotic landscapes made up of diverse colours, textures and patterns. - Unless there are water shortages, dust suppression techniques are to be implemented on all access roads. - Light fittings for security at night should reflect the light toward the ground and prevent light spill. - The operation and maintenance buildings should not be illuminated at night. - The operation and maintenance buildings should be painted with natural tones that fit with the surrounding environment. Non-reflective surfaces should be utilised where possible. - Where possible, overhead power lines should be aligned parallel to existing power lines and other linear features. - As far as possible, limit the number of maintenance vehicles, which are allowed to access the sites.

11.9 Social

Impact Phase: Cumulative							
Potential impact description: The creation of local employment and business opportunities, skills development and training which can be associated with cumulative impacts.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	H	M	Positive	M	M	H
With Mitigation	M	H	M	Positive	H	M	H
Can the impact be reversed?			Yes, by not proceeding with the implementation of the project and removing it.				
Will impact cause irreplaceable loss or resources?			No.				
Can impact be avoided, managed or mitigated?			Yes				
Mitigation measures to reduce residual risk or enhance opportunities: - The proposed establishment of the Paulputs WEF as a suitably sited renewable energy facility situated within the Kai !Garib and Khâi-Ma Local Municipalities in the Northern Cape Province of South Africa should be supported and developed. The enhancement and mitigation measures proposed in this SIA report and other specialist studies for the Paulputs WEF should be implemented.							

Impact Phase: Cumulative							
Potential impact description: Visual impact associated with the establishment of WEFs and impact on sense of place and character of area.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	M	Negative	M	M	M
With Mitigation	M	M	M	Negative	M	M	M
Can the impact be reversed?			Yes, by not proceeding with the implementation of the project and removing it.				

Will impact cause irreplaceable loss or resources?	No.
Can impact be avoided, managed or mitigated?	Yes
Mitigation measures to reduce residual risk or enhance opportunities: - The final placement of the wind turbines of the proposed Paulputs WEF should be communicated to the affected landowners; - Environmental Authorities should consider the overall cumulative impacts on the sense of place and consult the recommendations made in the Visual Impact Assessment specialist report in this regard, and implement those recommendations made.	

Impact Phase: Cumulative							
Potential impact description: Establishment of a number of renewable energy facilities (WEFs and SEFs), may potentially place pressure on local services, e.g. education, medical, accommodation etc.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	L	L	Negative	L	M	H
With Mitigation	M	L	L	Negative	L	M	H
Can the impact be reversed?	Yes, by implementing effective mitigation measures.						
Will impact cause irreplaceable loss or resources?	No.						
Can impact be avoided, managed or mitigated?	Yes						
Mitigation measures to reduce residual risk or enhance opportunities: - The Northern Cape Provincial Government, the Kai !Garib Local Municipality and the Khâi-Ma Local Municipality, as well as project proponents, should co-ordinate and manage the development of renewable energy facilities in the region. This way potential negative impacts could be effectively mitigated for and potential positive impacts be enhanced. This will also assist in the issues raised in the Integrated Development Plans (IDPs) of the Local Municipalities and to address those issues related to local service delivery.							

11.10 Traffic and Transportation

In the absence of definite information regarding other similar development initiatives in the area, it is assumed that the potential similar projects in the area, within 35 km radius of the Paulputs WEF, would be of similar magnitude as ascertained for other similar studies. Consequently, additional possible wind energy sites total some 300 MW and solar Polar Voltaic (PV) sites some 2325 MW are considered in this report.

It is likely that some of the already approved projects will be completed before the Paulputs WEF development is approved and constructed. However, as a worst case scenario, it is assumed that all these developments could coincide with the Paulputs WEF and that vehicle trips to site will follow the same inland (N7) route as proposed for the Paulputs WEF.

Assuming that all developments are built simultaneously, to similar project programmes, the cumulative sites could generate on average 144 construction vehicle trips to the various sites per day. This includes approximately 89 super-link (ISO trucks) trips to site per day (from Saldanha Port) for approximately 18 months for approved solar PV developments in the area. Included in the above are 11 super-load vehicle trips from Saldanha Port to site, along the inland (N7) route, over a period of some 75 days for the Paulputs WEF. Approximately 30 abnormal load trips are anticipated over the construction period, transporting transformers to the various solar PV sites.

Staff peak hour trips to the various sites increase from 18 to 144 trips, emanating from nearby towns such as Pofadder and Keimoes. This translates to some 90 private vehicle trips, 22 mini-bus taxi trips and 11 bus trips to the various sites each day.

Impact Phase: Cumulative							
Potential impact description: Route constraints Cumulative development impact with increased impact due to constraints for abnormal load and super-load vehicles en-route to site that could result in unacceptable traffic impact (compromised road safety and increased traffic congestion). Super-load (extra-long, low or tall vehicles exceeding abnormal load vehicle dimensional and mass limitations as defined in TRH11) will experience constraints along the chosen route, i.e. inadequate space to accommodate vehicle turning movements at R27 interchange under construction, spatial constraints at various intersections due to intersection geometry and street furniture (i.e. R27 / R399 intersection, R399 / N7 intersection, N7 traffic roundabout at Piketberg, N7/R355 and R355/N14 and N14 Voortrekker Road (N14) intersections), tight horizontal curves on R399 and on N7 in Piekenierskloof Pass might be inadequate for very long vehicles (transporting turbine blades and other) resulting in abnormal long vehicles centre-line tracking (encroaching into the opposing lane), no suitable roads exist on-site to access Wind Turbine locations.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	H	L	H	Negative	H	H	H
With Mitigation	H	L	L	Negative	L	L	H
Can the impact be reversed?			Yes				
Will impact cause irreplaceable loss or resources?			No				
Can impact be avoided, managed or mitigated?			Yes, impacts can be managed and mitigated.				
Mitigation measures to reduce residual risk or enhance opportunities: - Implement approved Transportation Plan to ensure safe transport of materials and equipment to site.							

The cumulative grid staff related vehicle trips, to and from the various sites from nearby towns such as Pofadder, Kakamas and Keimoes, would increase from 4 to 35 peak hour trips. The trip generation for the grid is negligible.

Impact Phase: Cumulative							
Potential impact description: Negligible Impacts (Grid) Very low vehicle trip generation with negligible impacts.							
Grid Option 1							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	L	H	Negative	L	L	M
With Mitigation	n/a	n/a	n/a	Negative	n/a	n/a	n/a
Can the impact be reversed?			Yes				
Will impact cause irreplaceable loss or resources?			No				
Can impact be avoided, managed or mitigated?			No				
Mitigation measures to reduce residual risk or enhance opportunities: - Cumulative Impacts are negligible. No mitigation measures are required.							

12 SUMMARY OF FINDINGS AND RECOMMENDATIONS

12.1 Specialists Impacts Summary

12.1.1 Geology, Soils and Agriculture

The proposed development is located on land zoned and used for agriculture (grazing). South Africa has very limited arable land and it is therefore critical to ensure that development does not lead to an inappropriate loss of potentially arable land. The assessment has found that the proposed development will only impact agricultural land which is of low agricultural potential and only suitable for grazing.

Due to the low agricultural potential of the site, and the consequent low agricultural impact, there are no restrictions relating to agriculture which preclude authorisation of the proposed development and therefore, from an agricultural impact point of view, the development should be authorised.

12.1.2 Geotechnical Study

Based on geological and geotechnical information obtained for Paulputs and interpretation thereof, there appears to be no geotechnical reason for the wind farm development not to proceed.

From a geotechnical point of view the project can surpass pre-feasibility stage and move to feasibility level investigations.

12.1.3 Aquatic

The proposed layout for the facility would seem to have limited impact on the aquatic environment as the proposed structures have avoided the delineated watercourses and only the internal road and underground cable network will require water course crossings.

Thus, based on the findings of this study no objection to the authorisation of any of the proposed activities inclusive of the alternatives is made at this point.

Therefore, based on the site visit the significance of the impacts assessed for the aquatic systems after mitigation would be LOW.

The final number of actual water course crossings can be determined when micro-siting occurs, but presently 67 crossings have been identified that would trigger the need for a Water Use License application (WULA) (a potential General Application [GA]) in terms of Section 21 c and i of the National Water Act (Act 36 of 1998) (NWA), should any construction take place within these areas. Should any of the present road crossings need to be upgraded then the opportunity exists to improve the current state (lack of habitat continuity) for example by replacing pipe culverts with box culverts. This opportunity to improve the hydrological conditions can be seen as a net benefit and has been assessed as part of the cumulative impact statement.

As the proposed activities has the potential to create erosion the following recommendations are reiterated:

- Vegetation clearing should occur in in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment, and suitable dust and erosion control mitigation measures should be included in the EMP to mitigate.
- All construction materials including fuels and oil should be stored in demarcated areas that are contained within berms / bunds to avoid spread of any contamination / leaks. Washing and cleaning of equipment should also be done in berms or bunds, to trap

any cement / hazardous substances and prevent excessive soil erosion. Mechanical plant and bowsers must not be refuelled or serviced within or directly adjacent to any channel. It is therefore suggested that all construction camps, lay down areas, batching plants or areas and any stores should be located more than 50 m from any demarcated watercourses.

- It is also advised that an Environmental Control Officer (ECO), with a good understanding of the local flora be appointed during the construction phase. The ECO should be able to make clear recommendations with regards to the re-vegetation of the newly completed / disturbed areas along aquatic features, using selected species detailed in this report.
- All alien plant re-growth must be monitored, and should these alien plants reoccur these plants should be re-eradicated. The scale of the operation does however not warrant the use of a Landscape Architect and / or Landscape Contractor.
- No transmission line towers, substations and construction camps will be placed within the delineated watercourses as well as their respective buffers without obtaining the required approvals from the relevant competent authority.
- It is further recommended that a comprehensive rehabilitation plan be implemented from the project onset within watercourse areas (including of buffers) to ensure a net benefit to the aquatic environment. This should from part of the suggested walk down as part of the final EMP preparation.

12.1.4 Flora and Terrestrial Fauna

It is recommended that the footprint within the CBA should be maintained at less than 20 ha as this would not be likely to have a significant negative impact on the functioning of this area. In terms of the limits of acceptable change within the different sensitivity categories provided for the development, the final development footprint is well within these limits and as such no limits of acceptable change have been exceeded by the development.

The key action that should be implemented to ensure that the development has relatively low impact on the receiving environment is planning-phase avoidance to ensure that the development footprint is restricted to the lower sensitivity areas of the site as far as possible. A number of higher sensitivity areas have identified in the area and these should be avoided as much as possible. The final development footprint within the different sensitivity categories are well-within the stated limits of acceptable change and as such, there are no fatal flaws in this regard and the development is considered acceptable from an ecological perspective.

The footprint of the Paulputs WEF is located within typical, low-sensitivity habitat with a low abundance of species of conservation concern. The post-mitigation impacts associated with the development would be of low significance. The contribution of the Paulputs WEF to cumulative impact in the area would be low and is considered acceptable. Overall, there are no specific long-term impacts likely to be associated with the development of the Paulputs WEF that cannot be reduced to an acceptable significance and no limits of acceptable change were exceeded by the development. As such, there are no fatal flaws associated with the development and no terrestrial ecological considerations that should prevent it from proceeding.

The Paulputs WEF grid connection options are acceptable and would generate low post-mitigation impacts on fauna and flora. There are no specific long-term impacts likely to be associated with the development of the Paulputs WEF Grid Connections that cannot be reduced to a low significance. The contribution of the power line and substation components to cumulative impact in the area would be low and is considered acceptable. As such, there are no fatal flaws associated with the development and no terrestrial ecological considerations that should prevent it from proceeding.

12.1.5 Avifauna

Activity and abundance of priority species and red data species were found to be very low to low on the proposed Paulputs development site. The diversity of these species recorded was also low. Abundances and diversity of small passerines was found to be low as well. Verreaux's Eagle were confirmed breeding 1.8 km outside of the WEF site boundary and > 3 km from the nearest proposed turbine, however the species was not recorded flying on site. The WEF site does not contain any important Verreaux's Eagle habitat, even though they may traverse the site or forage there occasionally. A 3 km buffer was implemented surrounding the nest site, in which no turbines may be placed.

Compared to other WEF sites flight activity of priority species was the lowest recorded on any WEF that the specialists have worked on or are aware of. Therefore the WEF site itself appears to be well suited for wind energy development from an avifaunal perspective. The associated grid connection however does have the potential to negatively impact certain species, particularly Ludwig's Bustard. This impact is partially mitigatable and considered acceptable when all mitigations have been applied. The shortest grid connection alternative is the preferred alternative from an avifaunal perspective, and therefore using Substation Option A, together with the grid connection connecting to the existing 132 kV line is preferred. However, all options are acceptable, if correctly mitigated.

The proposed layout was found to be acceptable as no turbines are proposed in areas of high avifaunal sensitivity. The remainder of the site is considered to be of low avifaunal sensitivity. All mitigation measures provided must be included in the EMPr or as a condition of the EA. From an avifaunal perspective, the project is acceptable and can be authorised.

12.1.6 Bats

Bat activity at the proposed Paulputs WEF is mostly low to moderate but was either high or very high in February, August and October. Therefore, the significance ratings for the majority of the impacts to bats posed by the development are predicted to be low or medium before mitigation. After mitigation, all impacts (besides cumulative impacts) are predicted to be low. Impacts related to bat mortality, and cumulative impacts, are predicted to be of high consequence, and high significance before mitigation. After mitigation these impact are predicted to be of medium consequence, and low significance for bat mortality, and low significance for cumulative impacts.

The mitigation measures are related to the design of the proposed WEF and associated grid connections and avoiding the placement of turbines in areas that bats are most active based on the pre-construction monitoring data. The current turbine layout adheres to the bat sensitivity map, with no blades intruding into bat buffers. Additional mitigation measures that must be considered are the choice of turbine model. The minimum distance between the blades and the ground must be maximised. Monitoring of bat activity and bat fatality during the operational phase of the WEF is needed to determine if any additional mitigation measures are needed. Attention must be given to bat fatality levels during operation of the facility which should be assessed relative to threshold levels. Mitigation options may include using deterrents or an operational minimization strategy (i.e. curtailment) during specific seasons and time periods for specific turbines coincident with periods of increased bat activity and fatality. It is likely that residual impacts to bats will be greater in February, August and October as this is when bat activity was high. The curtailment plan should be revised based on additional bat activity and bat fatality data collected during the operational phase of the project.

The bat monitoring data collected and analysed suggest that the development of the Paulputs WEF can be achieved without unacceptable risks to bats. In addition, based on the layout assessed in this report, all turbines currently adhere to the sensitivity buffers.

12.1.7 Noise

Whilst construction noise impacts are no more than Low significance, the noise management measures detailed below are recommended in the interest of best practice during construction operations:

- Construction activities should be limited to times agreed with the local municipalities;
- Deliveries of turbine components, plant and materials by HGV to site should only take place by designated routes and within times agreed with the relevant authorities;
- The site contractors should employ the best practicable means of reducing noise emissions from plant, machinery and construction activities, as described in BS 5228;
- Where practicable, the work programme should be phased, which would help to reduce the combined effects arising from construction operations;
- Where practicable, noise from fixed plant and equipment should be contained within suitable acoustic enclosures or behind acoustic screens;
- Where practicable, night time working should not be carried out. Local residents should be notified in advance of any potentially noisy night-time construction activities; and
- Any plant and equipment normally required for operation at night (19:00 - 07:00), e.g., generators, should be suitably screened or located such that noise levels from the plant do not exceed 45 dB, L_{Aeq} at the nearest noise-sensitive receptors.

Operational noise mitigation was embedded in the development during the design and Scoping stages, through maximising the distance from the wind turbines to the noise-sensitive developments. Potential impacts of no more than Low intensity were identified for the operation of the development; no further mitigation is therefore required.

Noise due to the construction and operation of the proposed development has been determined at the closest, and therefore most noise-sensitive developments, in accordance with internationally recognised methodologies.

The predicted noise levels have then been assessed against a number of criteria incorporating South African and international guidance. The worst-case level of impact was found to be Low at the closest noise-sensitive development, with no impacts anticipated for more distant noise-sensitive developments.

No significant impacts are therefore anticipated due to the proposed development, and as such, it is the opinion of the author that the proposed development may be authorised.

It is recommended that a condition is attached to the permission for the proposed development, requiring that noise due to the operation of the proposed development is not to exceed 45 dBA, $L_{Feq,8hr}$ at any residential dwelling present at the time of this consent.

In addition to the above, it is also recommended that a condition is attached requiring operational noise monitoring to be undertaken at the closest residential dwelling (H3), within 6 months of the development being fully commissioned. In the event that the development is found to exceed the noise limit specified above, the operator should implement a noise abatement programme in consultation with a suitably qualified Acoustics Consultant, and a further measurement undertaken to determine compliance. This cycle should continue until it can be demonstrated that the development is operating within its specified noise limit.

12.1.8 Heritage, Archaeology and Palaeontology

The assessment finds that numerous Stone Age archaeological resources occur throughout the WEF study area but that they are generally associated with water sources and rocky hills. The sensitive locations are all in the northern part of the WEF site. These are areas typically protected from development for various reasons and impacts to these heritage resources are not expected. The same applies to the power line routes, although these were not physically examined. There is still a small chance that isolated water holes with associated archaeological sites can be located in open areas but these could only be identified once a final road layout is available and surveyed.

The landscape is more natural than cultural but will experience visual impacts. The important part of this is that the N14 is considered a route of cultural significance and aesthetic value because of the qualities of the landscape through which it passes. Turbines would be placed on both sides of the road meaning that motorists would have to pass through the development. The power lines and substation, on the other hand, present a far more limited impact and, if the wind farm is constructed then the associated power line would have a negligible further impact. Despite the WEF straddling the road, and considering the benefits to the economy, the impacts to the N14 and surrounding landscape are not significant enough to be a fatal flaw, largely because the turbines would be in a cluster and not spread out over a lengthy section of the road in what is a very extensive landscape.

It is best practice to avoid all significant heritage sites but, if this is not possible, mitigation can still be effected if necessary.

It is recommended that a pre-construction archaeological survey be carried out within the authorised footprint in order to identify any residual issues and recommend mitigation as may be required.

It remains possible, that rare, isolated bones might be present and could be damaged or destroyed during construction activities. Mitigation would involve protecting and reporting any fossils that are found so that they can be examined and collected (if necessary) by a palaeontologist.

Because impacts of high significance are not expected to occur, it is recommended that the proposed WEF, power line and associated infrastructure (including all three substation locations) can be authorised. The following conditions must be included in the Environmental Authorisation should one be granted:

- The final authorised layout for the WEF, all internal roads, the power line, substation and any other areas to be disturbed must be surveyed by an archaeologist prior to construction in order to identify any remaining potential impacts that may need mitigation;
- Although it is noted that approval is being sought for all three substation locations and that all three are suitable from a heritage point of view, Option A is slightly preferred for construction over Options B & C because it is further from the N14;
- Identified sensitive sites must be treated as no-go areas throughout the lifetime of the project;
- If any turbines are removed as a result of the use of larger turbines at a later stage then priority should be given to removing turbines close to the N14; and
- If any archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.

- The final layout of the facility should be walked by an archaeologist at least six months prior to construction in order to determine whether any further archaeological sites may be present within the footprint. Recommendations for mitigation may need to be made at that time and such work would need to be carried out prior to construction.
- The only monitoring required as part of the Environmental Management Program (EMPr) is to ensure that the identified no-go areas are not transgressed during the construction, operation and, if applicable, decommissioning of the facility.

12.1.9 Visual

An EIA level visual study was conducted to assess the magnitude and significance of the visual impacts associated with the development of the proposed Paulputs WEF and associated grid connection infrastructure near Pofadder in the Northern Cape Province. Overall, sparse human habitation and the predominance of natural vegetation cover across much of the study area would give the viewer the general impression of a largely natural setting with some pastoral elements. As such, WEF development would alter the visual character and contrast significantly with the typical land use and/or pattern and form of human elements present across the broader study area. The level of contrast will however be reduced by the presence of the KaXu, !Xina and Konkoonies SEFs, the Paulputs substation and the existing high voltage power lines in close proximity to the Paulputs WEF application site.

The area is not typically valued for its tourism significance and there is limited human habitation resulting in relatively few potentially sensitive receptors in the area. The proposed WEF development will have a high level of impact on three (3) of these receptors, and a moderate level of impact on thirteen (13) identified receptors. The proposed 132kV power line and substation will have a moderate impact on eleven (11) potentially sensitive receptors.

An overall impact rating was also conducted as part of the scoping phase in order to allow the visual impact to be assessed alongside other environmental parameters. The assessment revealed that impacts associated with the proposed WEF, associated on-site infrastructure and grid connection infrastructure will be of moderate significance during construction. This could however be reduced to low with the implementation of mitigation measures.

During operation, visual impacts from the WEF would be of moderate significance with relatively few mitigation measures available to reduce the visual impact. Visual impacts associated with the WEF on-site infrastructure and the grid connection infrastructure during operation would be of low significance.

Although other renewable energy developments and infrastructure projects, either proposed or in operation, were identified within a 35km radius of the Paulputs WEF application site, it was determined that only eleven of these would have any significant impact on the landscape within the visual assessment zone. All eleven projects are SEFs and three are already in operation. These projects are concentrated in close proximity to Paulputs substation and the surrounding landscape has already undergone noticeable change. This concentration of facilities will alter the inherent sense of place and introduce an increasingly industrial character into a largely rural area. This will result in significant cumulative impacts, rated as medium during both construction and operation phases of the project. It is however anticipated that these impacts could be mitigated to acceptable levels with the implementation of the recommendations and mitigation measures stipulated for each of these developments by the visual specialists.

Three (3) substation site options and four (4) power lines route options were assessed as part of the EIA. All of these options are included in the EA application and as such they are not alternatives. All options were however assessed from a visual perspective and no fatal flaws were identified for any of the substation sites or power line route options.

The visual impacts associated with the proposed Paulputs WEF development and associated grid connection infrastructure are of moderate significance. Given the low level of human habitation and the absence of sensitive receptors, the project is deemed acceptable from a visual perspective and the EA should be granted. The impacts associated with the construction, operation and decommissioning phases of the project can be mitigated to acceptable levels provided the recommended mitigation measures are implemented.

12.1.10 Social

The findings of this Social Impact Assessment (SIA) conducted for the proposed Paulputs WEF indicates that during the construction and the operational phase of the proposed development project, various employment opportunities, with different levels of skills will be created. In addition this will also create local business opportunities benefitting the socio-economic development of the local communities of Pofadder and Kakamas. The local communities will however benefit from the establishment of a Community Trust if it is managed effectively. The challenges posed by climate change and global warming will be addressed by the investment in renewable energy facilities like the proposed Paulputs WEF.

The establishment of the proposed Paulputs WEF is therefore supported by the findings of this SIA report and therefore, also creating a positive social benefit for society.

12.1.11 Traffic and Transportation

It is recommended that the traffic and transport related impacts of the proposed Paulputs WEF and grid construction, operations and decommissioning be mitigated as set out in this report.

It is concluded that the proposed Paulputs WEF is expected to be built over a period of 24 months (and the grid is also expected to be built over a period of 24 months). The WEF and grid builds would run concurrently and is not expected to generate significant traffic volumes on the road network.

Some vehicles associated with the WEF build are particularly large and these super-load vehicles would be affected by constraints as identified (and possibly other constraints not identified) en-route from Saldanha Port to site.

A Traffic Management Plan must be prepared to reduce limit traffic congestion and to enhance road safety, in light of the additional traffic due to the associated WEF; and to ensure safe site access and a Transport Management Plan must be prepared to address transport of abnormal super-load and abnormal load vehicles to and on-site.

Grid crossing the N14 requires wayleave approval and road closure, assisted by Traffic Law Enforcement to enhance road safety.

There is a possibility that the WEF and grid construction work-zone activities could overlap on-site, which increases risk of vehicles crashing into workers. This could be mitigated by proper planning/project management, that should be dealt with in the Traffic Management Plan.

The WEF operations could on occasion require abnormal load vehicles (replacement parts) from Saldanha Port, which impact could be mitigated by reference to the Transport Management Plan.

During the decommissioning phase additional traffic to the site increases the risk of vehicle crashes at the WEF sites accesses to the N14. This should be mitigated in the Traffic Management Plan.

The construction of the Paulputs Wind Energy Project and various other solar PV energy projects planned within 35 km from the site could coincide with the Paulputs WEF and grid construction. The cumulative traffic is not significant considering the road network capacity in the vicinity of the site, but abnormal load and particularly super-load transportation from Saldanha Port should preferably be co-ordinated to limit impact (delay of traffic) on the road network where possible.

Taking the above findings into consideration it can be concluded that the development of the Paulputs WEF and grid and associated infrastructure will not have undue detrimental impact on traffic and that identified impacts can be suitable mitigated. It is the reasoned opinion of the specialist that the development of the Paulputs WEF (and grid) can be approved, from a traffic and transport engineering perspective, subject to the specific requirements / mitigation measures included in the specialist report.

12.2 Conditions to be Included in the Environmental Authorisation

12.2.1 Flora and Terrestrial Fauna

- Specific mitigation should be implemented during construction and operation to reduce the risk of poaching or harvesting on the local population of Quiver Trees (*Aloidendron dichotomum*), including implementation of a long-term population monitoring programme within the site for this species. Should the development be authorised and awarded preferred bidder an effective long-term population monitoring programme must be submitted to Directorate and Department of Environment and Nature Conservation for review.

12.2.2 Avifauna

- Operational monitoring to be undertaken by an appropriate specialist at commencement of operation of the WEF according to applicable guidelines.
- Should the project progress to financial close and potential funding is sought from the IFC, the project should be subjected to a full Critical Habitat Assessment (CHA) (for all taxa and species).

12.2.3 Bats

- Ensure the implementation of a post-construction monitoring programme (operation phase) to survey bat communities on the wind energy facility and the impacts resulting from the installed infrastructure, according to the Best Practice Guidelines (Sowler & Stoffberg 2016).
- Apply curtailment during February, August and October based on Bat Curtailment Plan if mortality does occur beyond threshold levels as determined based on applicable guidelines.

12.2.4 Noise

- Noise due to the operation of the proposed development is not to exceed 45 dBA, $L_{eq,8hr}$ at any residential dwelling present at the time of this consent.
- Operational noise monitoring to be undertaken at the closest residential dwelling (H3), within 6 months of the development being fully commissioned. In the event that the development is found to exceed the noise limit specified above, the operator should implement a noise abatement programme in consultation with a suitably qualified Acoustics Consultant, and a further measurement undertaken to determine compliance. This cycle should continue until it can be demonstrated that the development is operating within its specified noise limit.

12.2.5 Heritage

- A pre-construction archaeological survey must be carried out within the authorised footprint in order to identify any residual issues and recommend mitigation as may be required.
- A report detailing the results of the recommended walkdowns of the final layouts of the powerline and WEF must be compiled by a qualified archaeologist and submitted to SAHRA for comment once completed.

13 CONCLUSION

The proposed Paulputs WEF and Grid Connection 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 level. 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 readily available, technically viable and commercially cost-effective sources of renewable energy.

The impacts of the proposed development need to be viewed in the context of the country's energy mix and the negative externalities associated with the current dominant energy source of coal, often in areas of high potential soils, such as the Eastern Highveld, and the pollution that this form of energy generates. With this comparison in mind the impact of a wind energy facility is minimal compared to the damaging impacts of coal mining and coal-fired power generation. Indeed, wind energy is associated with positive externalities in the form of Economic Development benefits and the cheaper 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 agricultural potential plays a more significant role and in the role of externalities associated with power production.

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.

Operational phase monitoring of birds and bats that must be undertaken according to applicable guidelines current at the start of the operational phase will contribute to scientific knowledge regarding the impacts of wind farms on birds and bats. The information collected during the operational monitoring should be shared with BirdLife SA and the Endangered Wildlife Trust, 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).

Should the Paulputs WEF and Grid Connection be developed, the actual physical footprint of the wind turbines and associated infrastructure will occupy an area of land equivalent to approximately 2 % of the total project area. 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.

The EIA has concluded that no negative potential impacts identified and assessed by the specialists remain high significance with mitigation, including potential cumulative impacts associated with the proposed development. Potential negative impacts that remain medium significance after mitigation were identified by the ecology, bird, heritage, visual, social and traffic specialists while potential positive impacts of high significance after enhancement were identified by the social specialist.

The negative impacts associated with the proposed Paulputs WEF and Grid Connection are considered acceptable by the specialists, provided that all recommendations and mitigations are complied with and adhered to.

13.1 Impact Statement

Should the Paulputs WEF be developed, the actual physical footprint of the wind turbines and associated on-site infrastructure will occupy an area of land equivalent to approximately 2 % of the total proposed development site. 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. The Final Mitigated Layout avoids all sensitive areas identified by the specialists' investigations (Figure 12.1). 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.

The study has concluded that there are no negative high residual impacts, including potential cumulative impacts associated with the proposed development. The creation of local employment and business opportunities, skills development and training which can be associated with cumulative impacts, was rated as high positive. With mitigation all potential negative cumulative impacts are reduced to medium or low significance. Potential cumulative negative impacts that remain medium significance after mitigation were identified by the bird, heritage, social and visual specialists while a potential cumulative positive impact of high significance after enhancement was identified by the social specialist. The negative impacts associated with the proposed Paulputs WEF and Grid Connection are considered acceptable by the specialists.

Taking into consideration the findings of the EIA process for the proposed project and the fact that recommended mitigation measures have been used to inform the project layout design, 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.

Overall, it is recommended that the Paulputs WEF and Grid Connection be approved, subject to the implementation of all recommended mitigation measures and management actions contained in the specialist reports and in the EMPr.

Table 13 below provides recommended time periods for inclusion in the Environmental Authorisation (EA).

Table 13 - Periods Recommended for Inclusion in the Environmental Authorisation

EA Aspect	Recommended EA Period
The period within which commencement must occur;	The proposed activity must occur within ten years of environmental authorisation.
The period for which the environmental authorisation should be granted and the date by which the activity must have been concluded, where the environmental authorisation does not include operational aspects;	The construction aspects of the development should be authorised for a period of ten years, by which time construction should be complete. This development will include operational aspects.
The period that should be granted for the non-operational aspects of the environmental authorisation; and	The environmental authorisation is valid for a period of ten years, by which time the proposed developments should be constructed.
The period that should be granted for the operational aspects of the environmental authorisation.	Operational aspects that require environmental authorisation should be authorised for the maximum amount of time allowed to facilitate the

	time required to construct and operate a wind energy facility. This is typically 20 - 30 years.

14 SPECIALIST IMPACT TABLE SUMMARY

14.1 Construction Phase Impacts

Construction Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Geology, Soils and Agricultural Potential Impact							
Loss of agricultural land use	L	M	L	Negative	L	L	H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Soil degradation	L	M	M	Negative	M	M	H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Wetlands and freshwater							
Loss of riparian systems and disturbance of the alluvial watercourses	M	M	M	Negative	M	M	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Increase in sedimentation and erosion	M	M	M	Negative	M	M	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Localized surface water quality	M	M	M	Negative	M	L	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Terrestrial Ecological Impacts							

Construction Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
WEF							
Impacts on vegetation and plant species	M	H	H	Negative	M	H	H
With Mitigation	*M*	*H*	*M*	*Negative*	***M***	*H*	*H*
Direct and Indirect faunal impacts	L	L	M	Negative	M	H	H
With Mitigation	*L*	*L*	*M*	*Negative*	***M***	*H*	*H*
GRID							
Impacts on vegetation and plant species	L	H	M	Negative	M	H	H
With Mitigation	*L*	*H*	*L*	*Negative*	***L***	*H*	*H*
Direct and Indirect faunal impacts	L	L	M	Negative	M	H	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*M*	*H*
Avifauna							
Habitat destruction	L	H	L	Negative	M	L	H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Disturbance and Displacement	M	L	M	Negative	M	L	M
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*M*
Bats							
WEF							

Construction Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Roost disturbance	L	L	L	Negative	L	L	M
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*M*
Roost destruction	L	H	L	Negative	L	L	M
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Habitat modification	L	M	L	Negative	L	L	M
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*M*
Grid Connection							
Roost disturbance	L	L	L	Negative	L	L	M
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*M*
Roost destruction	L	H	L	Negative	M	L	M
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*M*
Noise							
WEF and Grid Connection							
Construction Noise	L	L	L	Neutral	L	L	H
With Mitigation	*L*	*L*	*L*	*Neutral*	***L***	*L*	*H*
Heritage and Archaeology							
Archaeological resources and graves	L	H	M	Negative	L	L	H
With Mitigation	*L*	*H*	*L*	*Negative*	***L***	*L*	*H*
Palaeontological resources	L	H	M	Negative	L	L	H

Construction Phase	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
With Mitigation	*L*	*H*	*L*	*Positive*	***L***	*L*	*H*
Cultural landscape for WEF	L	H	M	Negative	M	H	H
With Mitigation	*L*	*H*	*M*	*Negative*	***M***	*H*	*H*
Cultural landscape for Grid Connection	L	H	L	Negative	M	H	H
With Mitigation	*L*	*H*	*L*	*Negative*	***M***	*H*	*H*
Visual							
Paulputs WEF	M	L	M	Negative	M	M	M
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*M*	*M*
On-site Infrastructure	M	L	M	Negative	M	M	M
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*M*	*M*
Grid Infrastructure	M	L	M	Negative	M	M	M
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*M*	*M*
Social							
Creation of local employment and business opportunities	M	L	M	Positive	M	M	H
With Mitigation	*H*	*L*	*H*	*Positive*	***H***	*H*	*H*
Maximising of opportunities to local and regional SMMEs	M	L	M	Positive	M	M	H

Construction Phase	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
With Mitigation	*H*	*L*	*H*	*Positive*	***H***	*H*	*H*
Loss of grazing	L	M	L	Negative	L	L	L
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
In-migration or potential influx of job seekers	M	L	L	Negative	L	M	M
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*M*	*H*
Presence of construction workers	M	L	M	Negative	M	M	H
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*M*	*H*
Safety risk for farmers	M	L	M	Negative	M	M	H
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*L*	*H*
Impacts of heavy vehicles	M	L	M	Negative	M	M	H
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*M*	*H*
Risk of potential veld fires	M	L	M	Negative	M	M	H
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*L*	*H*
Traffic							
WEF							
Storage of Cargo	L	L	H	Negative	M	M	M
With Mitigation	*L*	*L*	*H*	*Negative*	***L***	*L*	*M*

Construction Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Route constraints	H	L	H	Negative	H	H	H
With Mitigation	*H*	*L*	*L*	*Negative*	***M***	*L*	*H*
Traffic congestion	H	L	M	Negative	M	M	M
With Mitigation	*H*	*L*	*M*	*Negative*	***L***	*L*	*M*
Intersection safety	L	L	H	Negative	M	H	M
With Mitigation	*L*	*L*	*H*	*Negative*	***M***	*M*	*M*
Grid Connection							
Safety on Site: Option 1	L	L	H	Negative	M	M	M
With Mitigation	*L*	*L*	*H*	*Negative*	***L***	*L*	*M*
N14 Safety: Option 1	L	L	H	Negative	M	M	M
With Mitigation	*L*	*L*	*H*	*Negative*	***L***	*L*	*M*
Intersection safety	L	L	H	Negative	M	M	M
With Mitigation	*L*	*L*	*H*	*Negative*	***L***	*L*	*M*

14.2 Operational Phase Impacts

Operation Phase	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Geology, Soils and Agricultural Potential Impact							
Loss of agricultural land use	L	M	L	Negative	L	L	H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Soil degradation	L	M	M	Negative	M	M	H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Generation of additional land use income	L	M	L	Positive	M	H	H
With Mitigation	*L*	*M*	*L*	*Positive*	***M***	*H*	*H*
Wetlands and freshwater							
Riparian systems through the possible increase in surface water runoff on riparian form and function	M	M	M	Negative	M	M	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Increase in sedimentation and erosion	M	M	M	Negative	M	M	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Localized surface water quality	M	M	M	Negative	M	L	H

Operation Phase	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Terrestrial Ecological Impacts							
Direct and Indirect faunal impacts for WEF	L	H	M	Negative	M	M	H
With Mitigation	*L*	*H*	*L*	*Negative*	***L***	*M*	*H*
WEF and Grid Connection							
Impact on CBAs & future conservation options	L	H	M	Negative	M	M	H
With Mitigation	*L*	*H*	*L*	*Negative*	***L***	*M*	*H*
Avifauna							
Collisions with turbines	L	H	H	Negative	M	L	M
With Mitigation	*L*	*M*	*H*	*Negative*	***L***	*L*	*M*
Collisions with power lines	L	H	H	Negative	H	H	H
With Mitigation	*L*	*H*	*H*	*Negative*	***M***	*L*	*M*
Electrocution	L	H	M	Negative	M	M	H
With Mitigation	*L*	*H*	*M*	*Negative*	***L***	*L*	*H*
Disturbance and Displacement	M	M	M	Negative	M	M	M
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*M*
Disruption of Local Bird Movement Patterns	M	M	L	Negative	L	L	H

Operation Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
With Mitigation	*M*	*M*	*L*	*Negative*	***L***	*L*	*H*
Bats							
WEF							
Habitat creation in high risk locations	L	M	L	Negative	M	M	M
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*M*
Bat mortality during commuting and/or foraging	M	H	H	Negative	H	M	M
With Mitigation	*L*	*H*	*L*	*Negative*	***L***	*L*	*L*
Bat mortality during migration	H	H	H	Negative	M	L	M
With Mitigation	*M*	*H*	*L*	*Negative*	***L***	*L*	*M*
Light pollution	M	M	L	Negative	M	M	M
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Grid Connection							
Bat mortality through collision with transmission lines	L	M	L	Negative	L	L	M
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*M*
Noise							
WEF and Grid Connection							
Day-time noise	L	H	L	Neutral	L	L	H

Operation Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
With Mitigation	*L*	*H*	*L*	*Neutral*	***L***	*L*	*H*
Night-time noise	L	H	L	Negative	L	L	H
With Mitigation	*L*	*H*	*L*	*Neutral*	***L***	*L*	*H*
Heritage and Archaeology							
Cultural landscape for WEF	L	H	M	Negative	M	H	H
With Mitigation	*L*	*H*	*M*	*Negative*	***M***	*H*	*H*
Cultural landscape for Grid Connection	L	H	L	Negative	M	H	H
With Mitigation	*L*	*H*	*L*	*Negative*	***M***	*H*	*H*
Visual							
Paulputs WEF	M	M	M	Negative	M	H	M
With Mitigation	*M*	*M*	*M*	*Negative*	***M***	*H*	*M*
On-site Infrastructure	L	M	L	Negative	L	L	M
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*M*
Grid Infrastructure	L	M	L	Negative	L	M	M
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*M*	*M*
Social							
Creation of local employment and business opportunities	M	M	L	Positive	M	M	H

Operation Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
With Mitigation	*M*	*M*	*M*	*Positive*	***M***	*H*	*H*
Up – and downstream economic opportunities for the community	M	M	L	Positive	M	M	H
With Mitigation	*M*	*M*	*M*	*Positive*	***M***	*M*	*H*
Establishment of renewable energy infrastructure and the generation of clean, renewable energy	M	H	M	Positive	M	M	H
With Mitigation	*M*	*H*	*H*	*Positive*	***H***	*H*	*H*
Generation of additional income for landowners	M	M	L	Positive	L	M	H
With Mitigation	*M*	*M*	*M*	*Positive*	***M***	*H*	*H*
Benefits associated with the establishment of a Community Trust	M	H	M	Positive	M	M	H
With Mitigation	*M*	*H*	*H*	*Positive*	***H***	*M*	*H*
Visual impact and associated impact on the sense of place	L	M	L	Negative	L	L	M-H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*M-H*
Tourism	M	M	L	Negative	L	M	H

Operation Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
With Mitigation	*M*	*M*	*L*	*Negative*	***L***	*M*	*H*
Traffic							
WEF							
Route constraints	H	H	H	Negative	H	M	M
With Mitigation	*H*	*H*	*L*	*Negative*	***M***	*M*	*M*
Intersection safety	L	H	H	Negative	H	M	M
With Mitigation	*L*	*H*	*H*	*Negative*	***M***	*L*	*M*
Grid Connection							
Negligible Impacts: Option 1	L	L	H	Negative	L	L	M
With Mitigation	*n/a*	*n/a*	*n/a*	*Negative*	***n/a***	*n/a*	*n/a*

14.3 Decommissioning Phase Impacts

Decommissioning Phase	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Geology, Soils and Agricultural Potential Impact							
Loss of agricultural land use	L	M	L	Negative	L	L	H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Soil degradation	L	M	M	Negative	M	M	H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Wetlands and freshwater							
Loss of riparian systems and disturbance of the alluvial watercourses	M	M	M	Negative	M	M	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Riparian systems through the possible increase in surface water runoff on riparian form and function	M	M	M	Negative	M	M	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Increase in sedimentation and erosion	M	M	M	Negative	M	M	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*

Decommissioning Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Localized surface water quality	M	M	M	Negative	M	L	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Terrestrial Ecological Impacts							
WEF and Grid Connection							
Faunal Impacts	L	L	M	Negative	M	H	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*M*	*H*
WEF							
Soil Erosion	L	H	M	Negative	M	H	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Grid Connection							
Soil Erosion	L	M	L	Negative	L	M	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*H*
Noise							
WEF and Grid Connection							
Decommissioning Noise	L	L	L	Neutral	L	L	H
With Mitigation	*L*	*L*	*L*	*Neutral*	***L***	*L*	*H*
Heritage and Archaeology							
Cultural landscape for WEF	L	H	M	Negative	M	H	H

Decommissioning Phase	**Extent**	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
With Mitigation	*L*	*H*	*M*	*Negative*	***M***	*H*	*H*
Cultural landscape for Grid Connection	L	H	L	Negative	M	H	H
With Mitigation	*L*	*H*	*L*	*Negative*	***M***	*H*	*H*
Visual							
Visual impacts during the decommissioning phase are potentially similar to those associated with the construction phase							
Social							
Loss of employment opportunities and associated income	M	M	M	Negative	M	M	H
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*M*	*H*
Traffic							
WEF							
Intersection Safety	L	L	H	Negative	M	H	M
With Mitigation	*L*	*L*	*H*	*Negative*	***M***	*M*	*M*
Grid Connection							
Intersection Safety: Grid option 1	L	L	H	Negative	M	M	M
With Mitigation	*L*	*L*	*H*	*Negative*	***L***	*L*	*M*

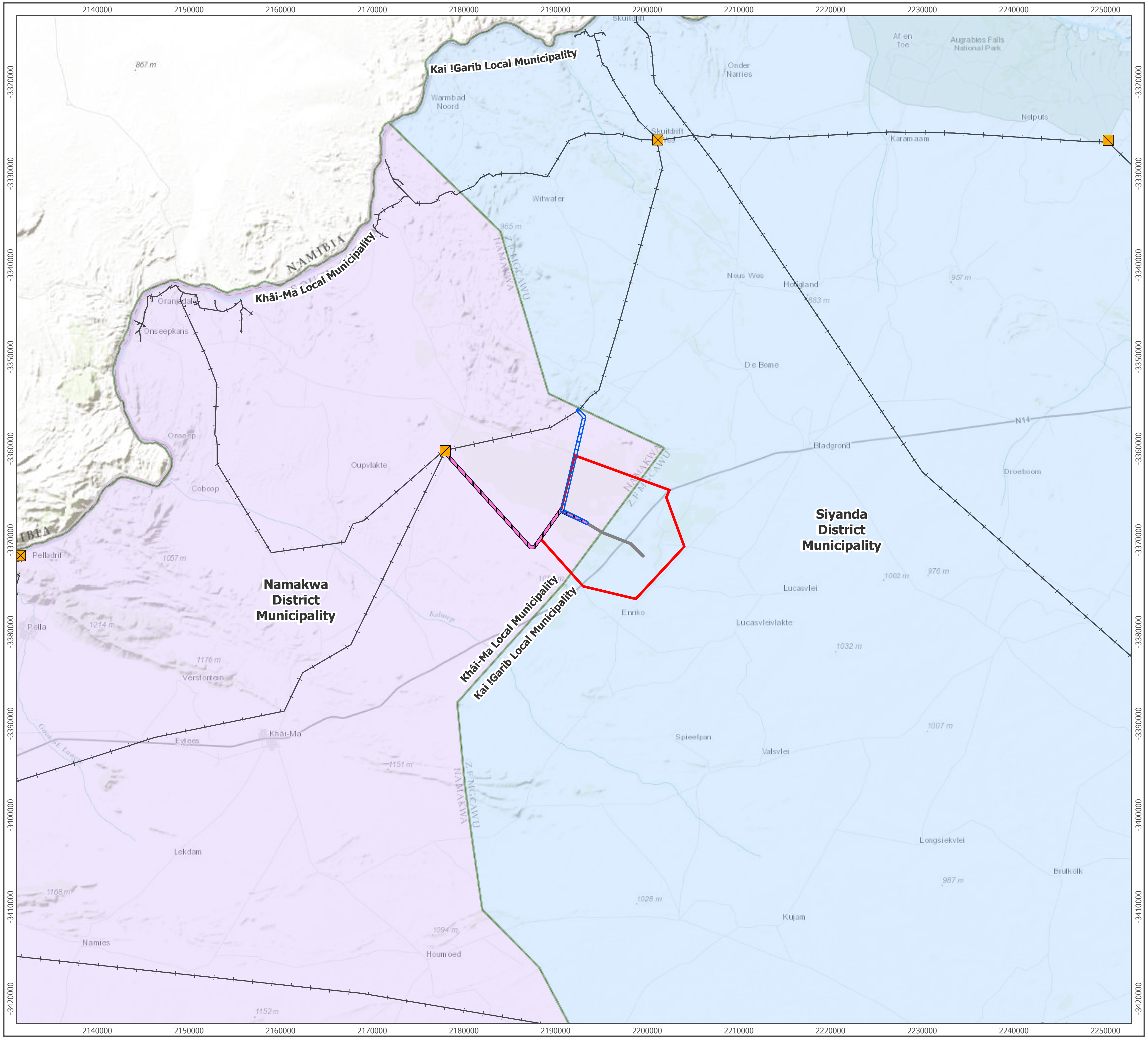
14.4 Cumulative Phase Impacts

Cumulative Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
Geology, Soils and Agricultural Potential Impact							
Regional loss of agricultural land use	L	M	L	Negative	L	L	H
With Mitigation	*L*	*M*	*L*	*Negative*	***L***	*L*	*H*
Wetlands and freshwater							
Projects within a 50km radius	M	M	M	Negative	M	H	H
With Mitigation	*L*	*L*	*L*	*Negative*	***L***	*L*	*L*
Terrestrial Ecological Impacts							
WEF							
Habitat loss and impact on broad-scale ecological processes	M	H	M	Negative	M	H	H
With Mitigation	*L*	*H*	*L*	*Negative*	***L***	*M*	*H*
Grid connection							
Habitat loss and impact on broad-scale ecological processes	L	H	M	Negative	L	M	H
With Mitigation	*L*	*H*	*L*	*Negative*	***L***	*M*	*H*
Avifauna							
Cumulative impacts on Birds	H	M	H	Negative	H	M	M

Cumulative Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
With Mitigation	*H*	*M*	*H*	*Negative*	***M***	*M*	*M*
Bats							
Bat mortality impacts	H	H	M	Negative	M	L	M
With Mitigation	*H*	*H*	*L*	*Negative*	***L***	*L*	*M*
Heritage and Archaeology							
Archaeological resources and graves	L	H	L	Negative	L	L	H
With Mitigation	*L*	*H*	*L*	*Negative*	***L***	*L*	*H*
Palaeontological resources	L	H	M	Negative	L	L	H
With Mitigation	*L*	*H*	*L*	*Negative*	***L***	*L*	*H*
Cultural landscape	L	H	M	Negative	M	H	H
With Mitigation	*L*	*H*	*M*	*Negative*	***M***	*H*	*M*
Visual							
Construction	M	M	M	Negative	M	M	L
With Mitigation	*M*	*M*	*M*	*Negative*	***M***	*M*	*L*
Operation	M	M	M	Negative	M	M	M
With Mitigation	*M*	*M*	*M*	*Negative*	***M***	*M*	*M*
Social							
Creation of local employment and	M	H	M	Positive	M	M	H

Cumulative Phase	Extent	Duration	Intensity	Status	Significance	Probability	Confidence
business opportunities							
With Mitigation	*M*	*H*	*M*	*Positive*	***H***	*M*	*H*
Visual impact associated with the establishment of WEFs and impact on sense of place and character of area	M	M	M	Negative	M	M	M
With Mitigation	*M*	*M*	*M*	*Negative*	***M***	*M*	*M*
Establishment of a number of renewable energy facilities	M	L	L	Negative	L	M	H
With Mitigation	*M*	*L*	*L*	*Negative*	***L***	*M*	*H*
Traffic							
WEF							
Route constraints	H	L	H	Negative	H	H	H
With Mitigation	*H*	*L*	*L*	*Negative*	***L***	*L*	*H*
Grid Connection							
Negligible Impacts: Grid option 1	L	L	H	Negative	L	L	M
With Mitigation	*n/a*	*n/a*	*n/a*	*Negative*	***n/a***	*n/a*	*n/a*

FIGURES



Paulputs WEF Site Boundary
Existing Eskom Substation
Existing Eskom Transmission Lines
Grid Connecting Substation Options A, B, C
Grid Option A
Grid Option B
Grid Option C
Local Municipality Boundary
Namakwa District Municipality
Siyanda District Municipality

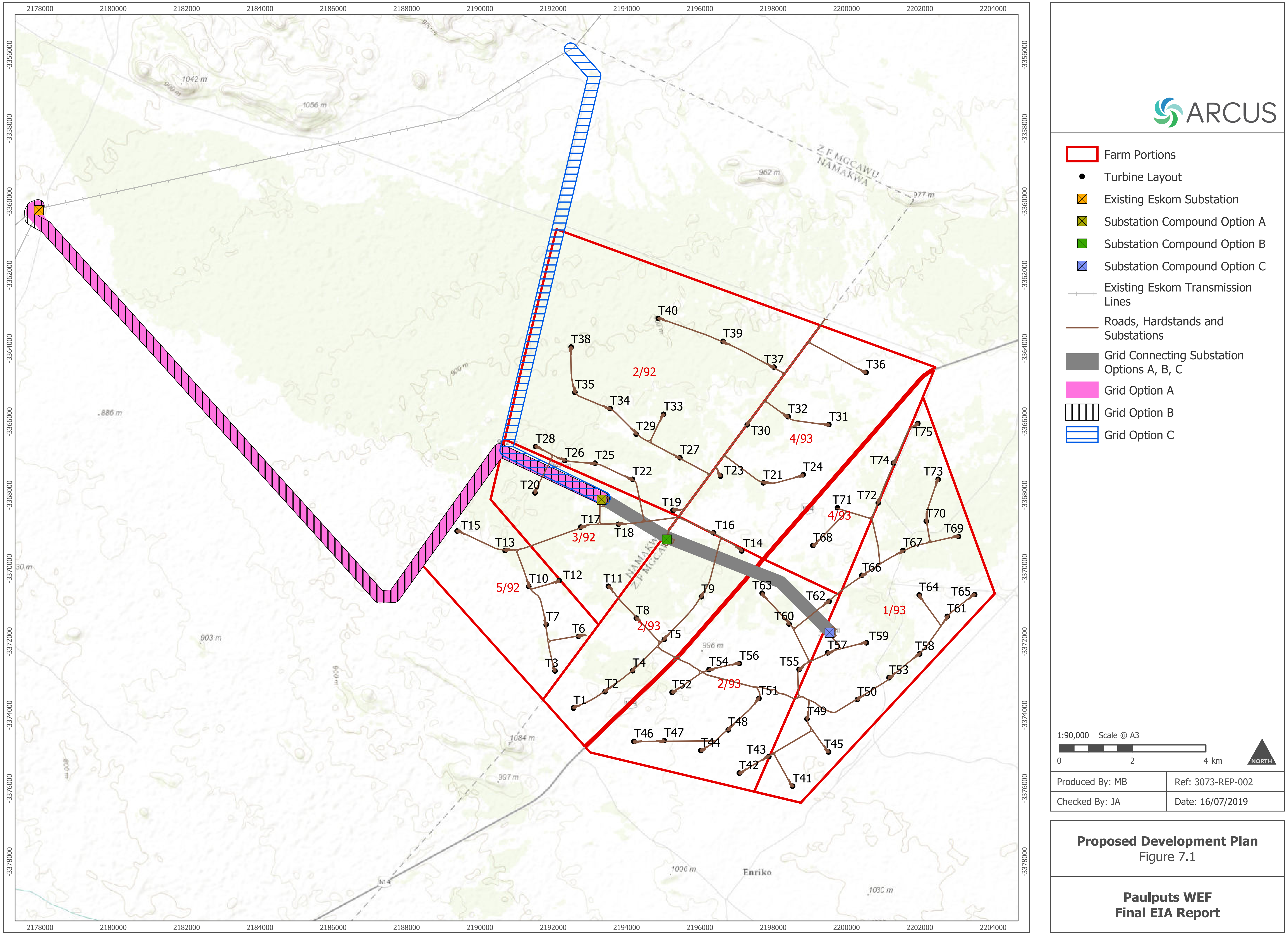
ARCUS

1:400,000 Scale @ A3
0 10 20 km
NORTH

Produced By: MB	Ref: 3073-REP-001
Checked By: JA	Date: 16/07/2019

Site Location
Figure 1

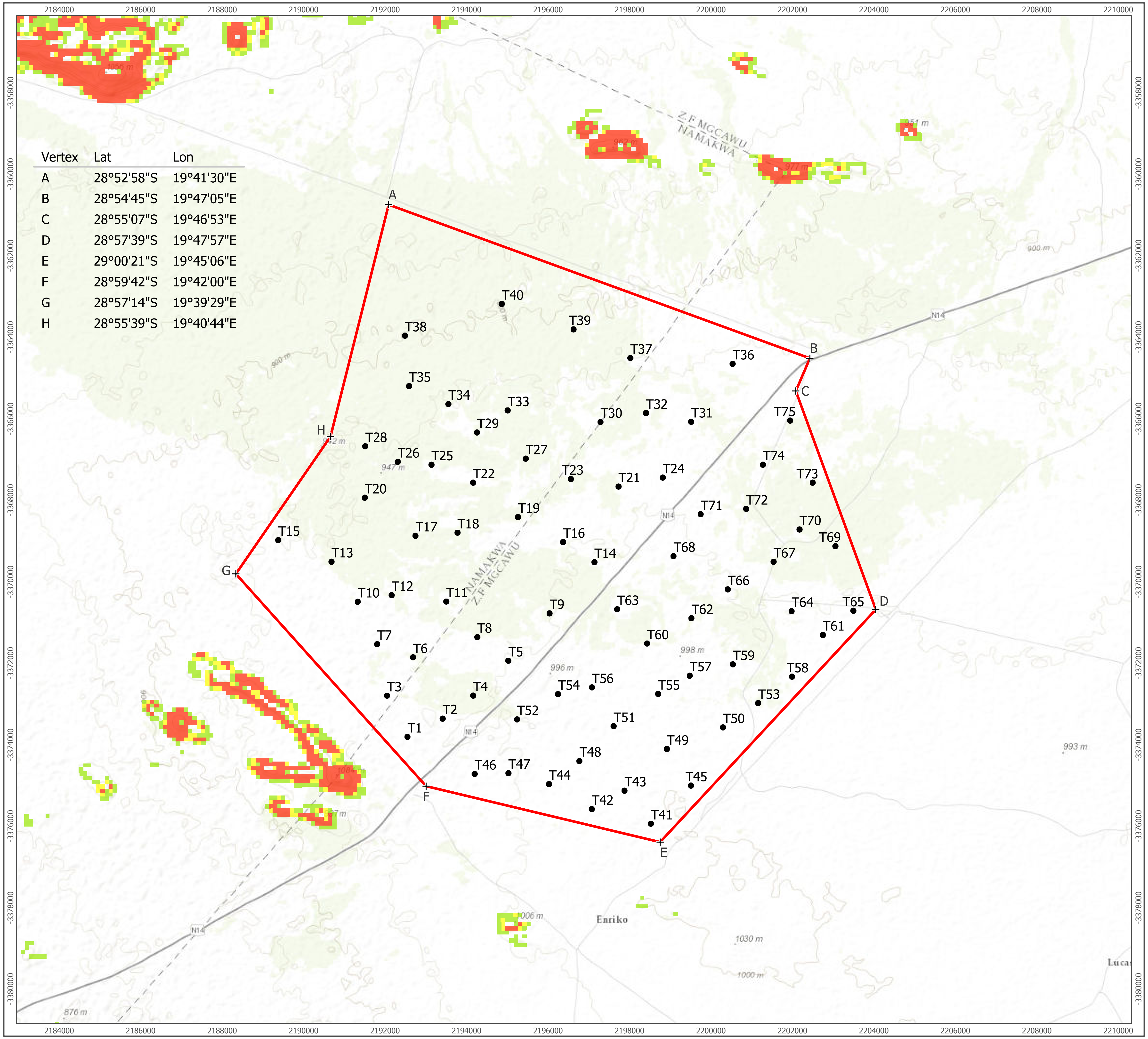
Paulputs WEF
Final EIA Report



Produced By: MB | Ref: 3073-REP-002
Checked By: JA | Date: 16/07/2019

Proposed Development Plan
Figure 7.1

Paulputs WEF
Final EIA Report



Vertex	Lat	Lon
A	28°52'58"S	19°41'30"E
B	28°54'45"S	19°47'05"E
C	28°55'07"S	19°46'53"E
D	28°57'39"S	19°47'57"E
E	29°00'21"S	19°45'06"E
F	28°59'42"S	19°42'00"E
G	28°57'14"S	19°39'29"E
H	28°55'39"S	19°40'44"E

ARCUS

Paulputs WEF Site Boundary

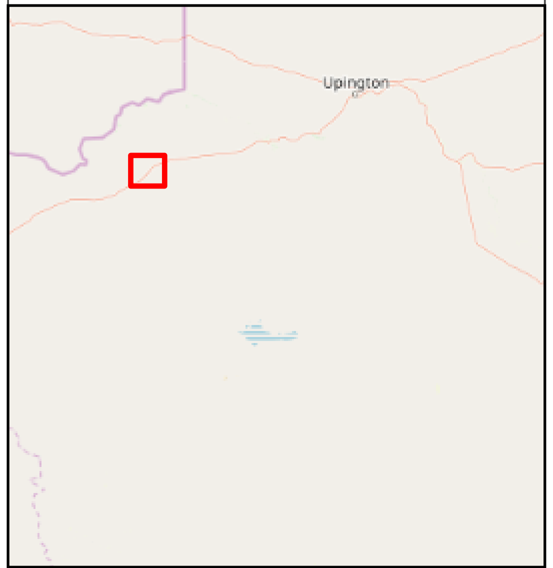
Turbine Layout

Slope (%)

8 - 12

12 - 14

>14



1:90,000 Scale @ A3

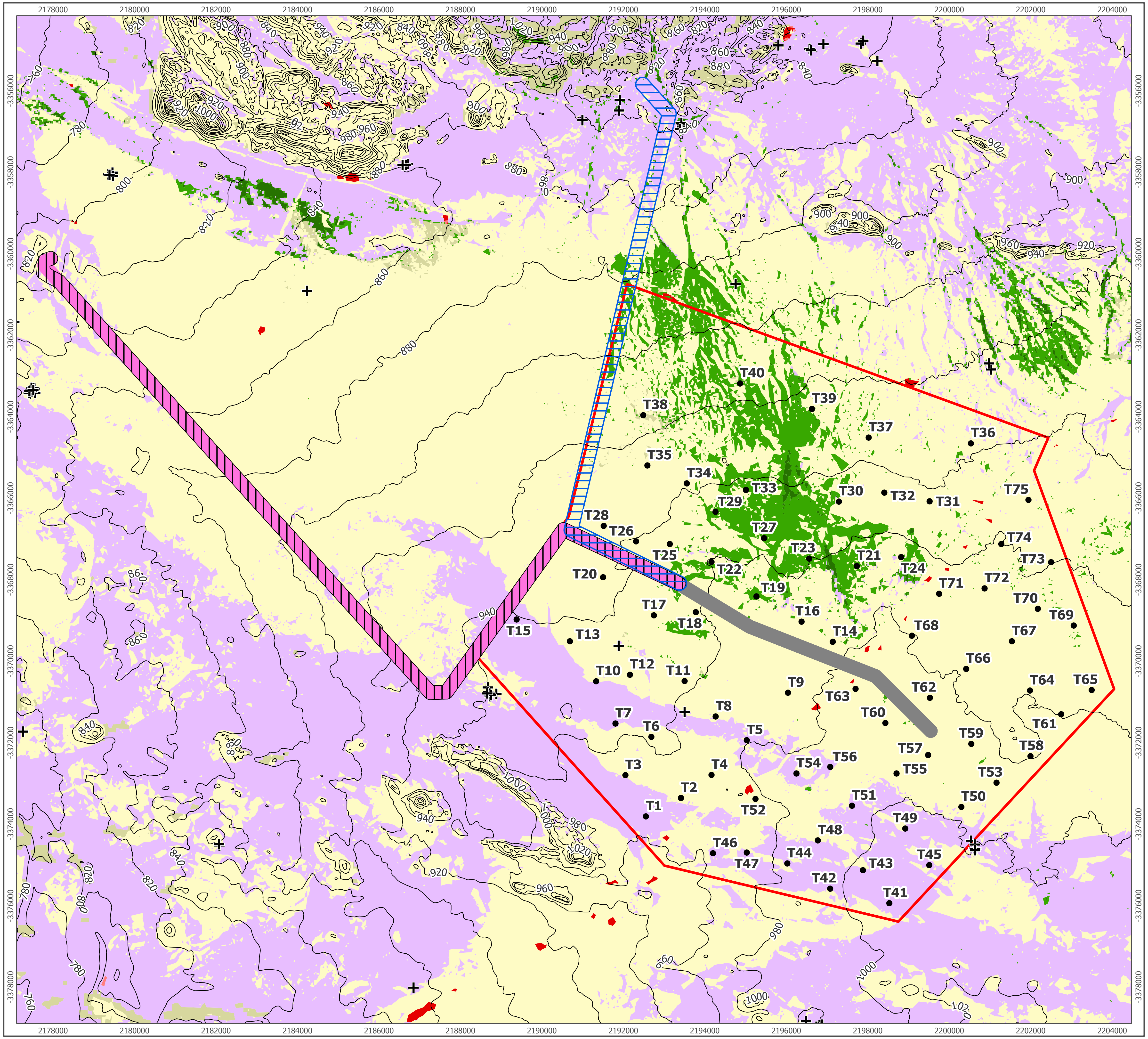
0 2 4 km

NORTH

Produced By: MB	Ref: 3073-REP-003
Checked By: JA	Date: 16/07/2019

Slope Analysis Map
Figure 7.2

Paulputs WEF
Final EIA Report



Paulputs WEF Site Boundary

Turbine Layout

Buildings

Contour Lines

Grid Connecting Substation Options A, B, C

Grid Option A

Grid Option B

Grid Option C

Landcover

Water permanent

Bare none vegetated

Grassland

Low shrubland

Thicket/Dense bush

Woodland/Open bush

Mines 1 bare

Mines 2 semi-bare

1:90,000 Scale @ A3

0 2 4 km

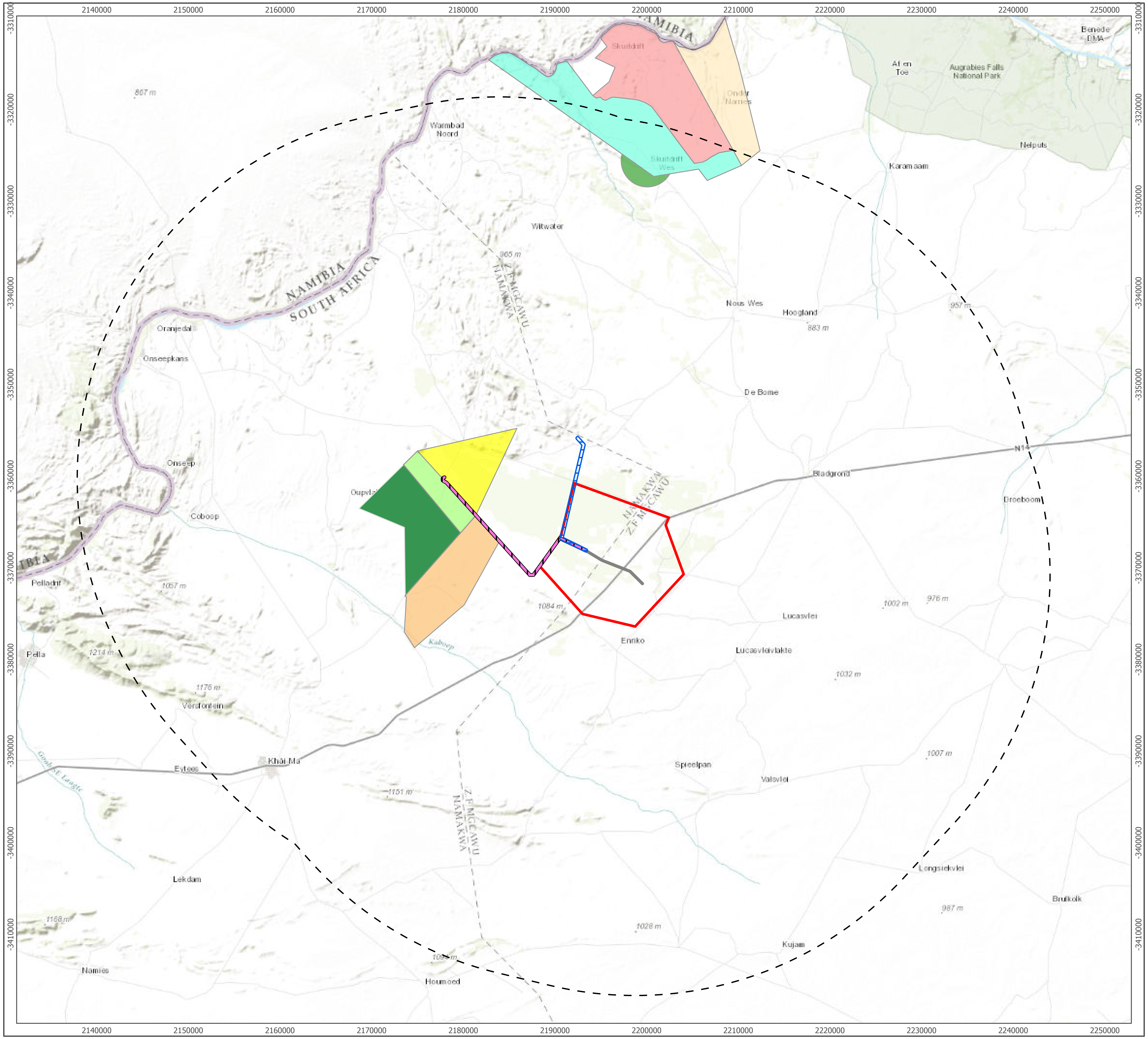
NORTH

Produced By: MB	Ref: 3073-REP-004
Checked By: JA	Date: 16/07/2019

Land Use

Figure 7.3

Paulputs WEF
Final EIA Report



ARCUS

Paulputs WEF Site Boundary

35 km Radius

Grid Connecting Substation Options A, B, C

Grid Option A

Grid Option B

Grid Option C

DEA Renewable Energy Applications Except Withdrawn/Lapsed

200 MW CSP Facility

Proposed Skuitdrif Solar PV

Proposed 133 MW Solar PV

Proposed 75MW Khoi-Sun Solar PV

Proposed Southern Cross Solar PV

Proposed Tutwa Solar PV

Proposed Konkoonsies and Kleinzwart Solar PV

Paulputs PV

1:400,000 Scale @ A3

0 10 20 km

NORTH

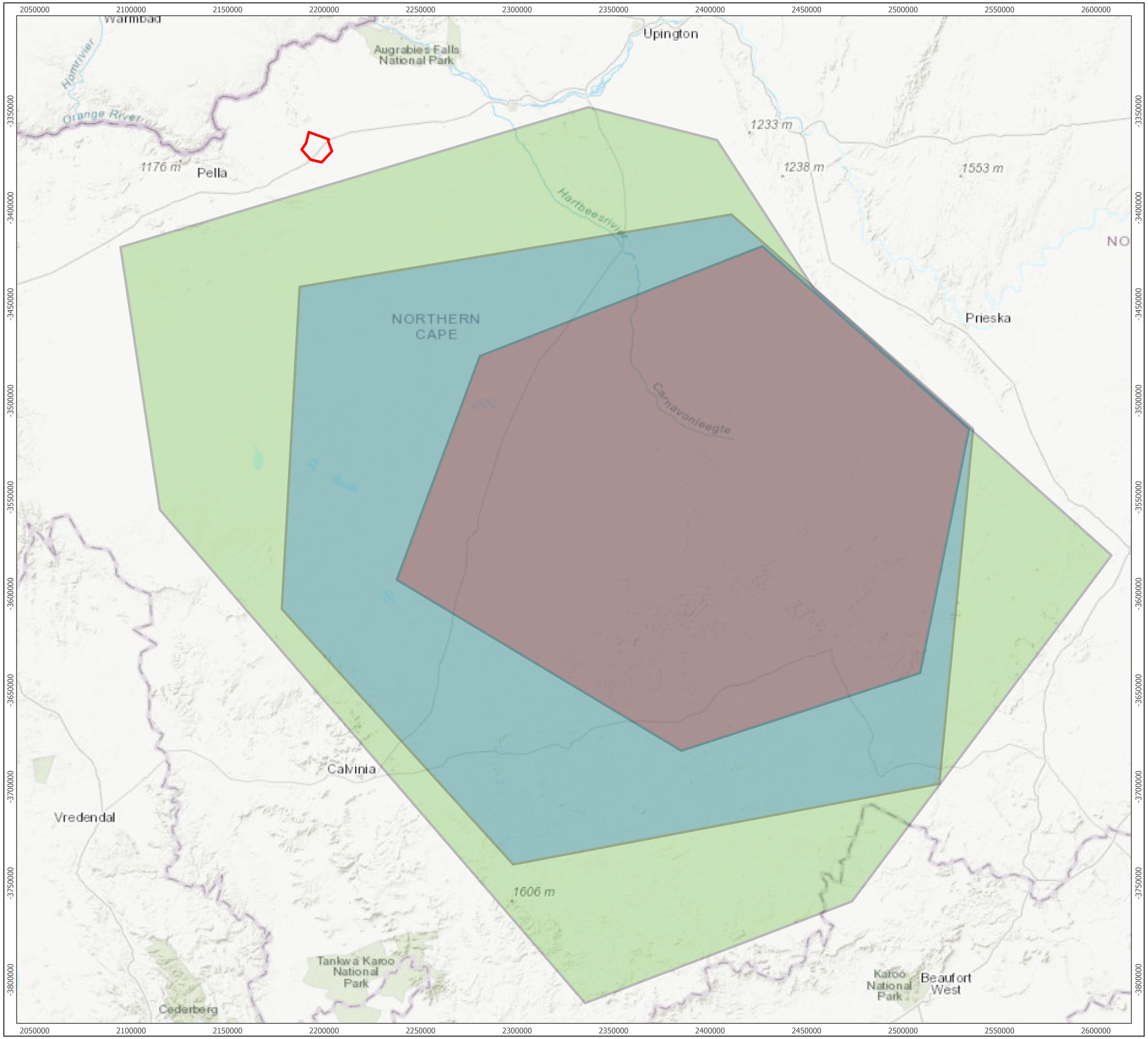
Produced By: MB	Ref: 3073-REP-005
Checked By: JA	Date: 16/07/2019

Renewable Energy Projects Within 35 km Radius

Figure 3.1

Paulputs WEF Final EIA Report

S:\GIS\Projects\3073 Paulputs WEF EIA\3073 Paulputs WEF EIA.aprx\3073-REP-005 Fig 3.1 Renewable Energy Projects within 35km radius



ARCUS

Paulputs WEF Site Boundary
KCAAA1
KCAAA2
KCAAA3

1:1,900,000 Scale @ A3

0 40 80 km

NORTH

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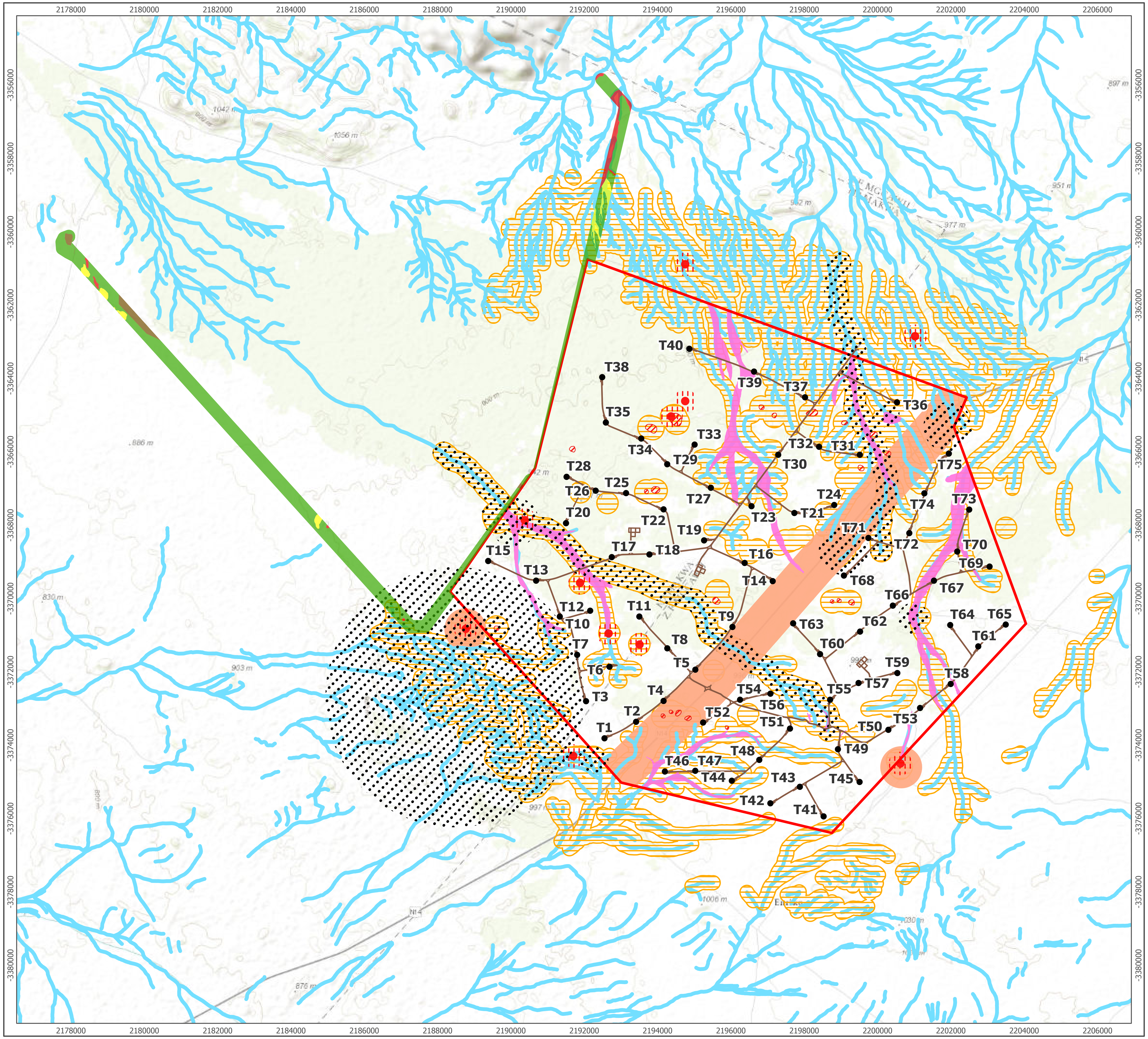
Checked By: JA	Date: 16/07/2019

Location of Paulputs in Relation to SKA Figure 3.2

Paulputs WEF Final EIA Report



ARCUS

Paulputs WEF Site Boundary
Turbine Layout
Roads, Hardstands and Substations

WEF Constraints
Ecology - No Go
Noise - No Go
Aquatic - High
Ecology - High (No Turbines - other infrastructure permitted)
Noise - High
Visual - High
Bats - No Go (No Turbines - other infrastructure permitted)
Birds - No Go (No Turbines - other infrastructure permitted)

Grid Ecological Sensitivity
Low
Medium
High
Transformed

1:100,000 Scale @ A3

0 2.5 5 km

NORTH

Produced By: MB	Ref: 3073-REP-009
Checked By: JA	Date: 16/07/2019

Environmental Sensitivity Map
Figure 12.1

Paulputs WEF
Final EIA Report

Appendix A: EAP Declaration of Independence & CV

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Proposed Paulputs Wind Energy Facility and Associated Grid Connection, Northern Cape Province

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP) INFORMATION

EAP Company Name:	Arcus Consultancy Services South Africa (Pty) Ltd			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	100%
EAP name:	Ashlin Bodasing			
EAP Qualifications:	Bachelor of Social Science (Geography and Environmental Management			
Professional affiliation/registration:	None			
Physical address:	Office 220, Cube Workspace, Icon Building c/r Long Street and Hans Strijdom Avenue Cape Town			
Postal address:	Office 220, Cube Workspace, Icon Building c/r Long Street and Hans Strijdom Avenue Cape Town			
Postal code:	8001	Cell:	0763408914	
Telephone:	0214121529	Fax:		
E-mail:	ashlinb@arcusconsulting.co.za / paulputs@arcusconsulting.co.za			

The appointed EAP must meet the requirements of Regulation 13 of GN R982 of 04 December 2014, as amended.

2. DECLARATION BY 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 13 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.

APPENDIX 10
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 13 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:~~

____

____

____

____

Signature of the environmental assessment practitioner

Arcus Consultancy Services South Africa (Pty) Ltd

Name of company:

09/07/2014

Date

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 South Africa (Pty) Ltd

Name of Company

09/07/2019

Date

Peter Hugh Martyn Cohen
Commissioner of Oaths
Practising Attorney SA
ENSafrica
1 North Wharf Square
Loop Street Cape Town 8001

Signature of the Commissioner of Oaths

09/07/2019

Date

CURRICULUM VITAE

Ashlin Bodasing

Technical Director and Environmental Assessment Practitioner

Email: ashlinb@arcusconsulting.co.za Tel: +27 (0) 21 412 1529

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 fourteen 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

<u>Environmental Impact Assessments</u>

- **Highlands North, South and Central Wind Energy Facilities, 2018-present**. Project Director (client liaison) and Lead EAP.

- **Paulputs Wind Energy Facility, 2018-present.** Project Director (client liaison) and Lead EAP.
- **San Kraal Wind Energy Facility, 2016- 2018**. Project Director (client liaison) and Lead EAP.
- **Phezukomoya Wind Energy Facility, 2016 – 2018**. Project Director (client liaison) and Lead EAP.
- **Kolkies and Karee Wind Energy Facilities, 2016-2016**. Project Director (Client liaison) and Lead EAP.
- **Komsberg East and West Wind Energy Facilities 2015-2016**. Project Director (Client Liaison) and EAP.
- **Umsinde Emoyeni Wind Energy Facilities, 2015-2018.** Project Director (Client Liaison) and EAP.

Ecological Impact Assessments and Monitoring

- **Confidential Wind Farm, 2017-2018, Northern Cape Province**. Project Director (Client Liaison), coordination and management of ecologists (bird and bat), review of technical and specialists impact assessments.
- **Paulputs Wind Energy Facility 2017-present, Northern Cape Province.** Project Director (Client Liaison), coordination and management of ecologists (bird and bat), review of technical and specialists impact assessments.
- **Highlands Wind Energy Facilities 2017 – 2018, Northern Cape Province.** Project Director (Client Liaison), coordination and management of ecologists (bird and bat), review of technical and specialists impact assessments.
- **Komsberg Wind Farms, 2015-2016.** Project Director (Client Liaison), coordination and management of ecologists (bird and bat), review of technical 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.

Appendix B: Environmental Management Programme

ARCUS

ENVIRONMENTAL MANAGEMENT PROGRAMME FOR THE PROPOSED 300 MW PAULPUTS WIND ENERGY FACILITY AND GRID CONNECTION, NORTHERN CAPE PROVINCE

On behalf of

PAULPUTS WIND ENERGY FACILITY (RF) (PTY) LTD

AUGUST 2019

DEA Reference No.: 14/12/16/3/3/2/1120

Prepared By:

Arcus Consultancy Services South Africa (Pty) Ltd
Registered in South Africa No. 2015/416206/07

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 (EMPR): The EMPR is a detailed plan for the implementation of the mitigation measures to minimise negative environmental impacts during the life-cycle of a project. The EMPR contributes to the preparation of the contract documentation by developing clauses to which the contractor must adhere for the protection of the environment. The EMPR 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 EMPR 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 EMPR.

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 EMPR (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 EMPR.

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

WKN Windcurrent South Africa (Pty) Ltd, through the Special Purpose Vehicle (SPV), Paulputs Wind Energy Facility (RF) (Pty) Ltd, (the Developer) are proposing to develop the Paulputs Wind Energy Facility (WEF), and associated infrastructure including Grid Connection Infrastructure near the town of Pofadder, in the Northern Cape Province (Figure 1).

Arcus Consultancy Services South Africa (Pty) Ltd ('Arcus') have been appointed by WKN Windcurrent to compile and submit the Environmental Management Programme (EMPr) to the Department of Environmental Affairs (DEA) as part of the Environmental Impact Assessment process for the Paulputs WEF and Grid Connection (DEA Reference No.: 14/12/16/3/3/2/1120).

This document, the environmental management programme (EMPr) must be seen as dynamic, and be updated when and if required, throughout the lifecycle of the project.

The EMPr 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 and operational period of the proposed development.

1.2 Details of the Applicant and the Environmental Assessment Practitioner

Details of Applicant	
Project Applicant	Paulputs WEF RF (Pty) Ltd
Company Registration	
Contact Person	Alan Wolfromm
Postal Address	PO Box 762, Wilderness 6560
Telephone	082 529 4909
Fax	None
Email	MrWolf@wkn-windcurrent.com

Environmental Assessment Practitioner	
EAP	Arcus Consultancy Services SA (Pty) Ltd
Contact Person	Ashlin Bodasing
Qualifications	Bachelor of Social Science - Geography and Environmental Management
Postal Address	Office 220, Cube Work Space, 24 Hans Strijdom Avenue, Cape Town, 8001
Telephone	021 412 1529
Fax	None
Email	ashlinb@arcusconsulting.co.za

Ashlin Bodasing

Qualifications	Bachelor of Social Science (Geography and Environmental Management)
Experience in Years	14 years
Experience	Ashlin Bodasing is the Technical Director at Arcus, located in Cape Town. Having obtained her Bachelor of Social Science Degree from the University of Kwa-Zulu Natal; she has over 14 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. 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 reviews. She has worked in Mozambique, Botswana, Lesotho and Zimbabwe.

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), an 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 benefits 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 the 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.

All management plans and mitigation measures should be adaptive and amended as required based on audits of their effectiveness.

2 THE PROPOSED PROJECT

The proposed Paulputs WEF is located approximately 50 km (centre point of the site) northeast of Pofadder and approximately 80 km northwest of Kakamas in the Northern Cape Province. The proposed Paulputs WEF is situated in two district municipalities, the Namakwa District Municipality and the ZF Mgcawu District Municipality, and within the Khâi-Ma Local Municipality and the Kai !Garib Local Municipality.

The proposed Paulputs WEF will comprise of up to 75 turbines, each having a maximum installed capacity of up to 6 megawatts (MW). Turbines will have a maximum height to tip of blade of 230 m, with a hub height of 140 m and a rotor diameter of 180 m.

The proposed development aims to generate and distribute electricity from renewable wind energy resource into the national grid by connecting the onsite switching station(s) with 132 kV overhead powerlines to the existing Eskom Paulputs Substation or the existing 132 kV overhead powerline. Three overhead powerline route options are proposed from the onsite switching station Option A to the existing Eskom Paulputs Substation or the existing 132 kV overhead powerline. Overhead powerline Options A and B are approximately 19.6 km in length, while overhead powerline Option C is approximately 12.5 km. Internal reticulation between onsite substation Option A and Option C is approximately 6.5 km of overhead powerlines, assessed as a 300 m wide corridor by the specialists.

Only one of the three main grid connection options will be utilised, and a portion of the line connecting the substation options depending on which proposed substation location(s) are chosen. Specialists assessed all proposed grid connection options as 300 m corridors, and all options are being applied for. Servitude area assessed by the specialists, took into account the worst case scenario, i.e. longest possible 31 m wide servitude of approximately 26.8 km - grid connection Option B with internal reticulation between on-site substations added.

The proposed location of turbines seeking approval from the DEA is presented in Figure 2. These locations have been identified based on specialist constraints and sensitivity mapping conducted through various phases, including feasibility, and impact assessment. This allowed placement of turbines in areas of medium to low sensitivity (Figure 3).

If awarded Preferred Bidder Status, Paulputs Wind Energy Facility (RF) Pty Ltd would enter into an implementation agreement with the Department of Energy (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.

In summary the proposed development will comprise the following:

- Up to 75 turbines with a generation capacity up to 6 MW and a rotor diameter of up to 180 m, a hub height of up to 140 m and blade length of up to 90 m;
- Foundations, hardstands, temporary and permanent laydown areas associated with the wind turbines of approximately 0.8 ha;
- Internal access roads of approximately 80 km in length (mostly 6 m wide but up to 12 m, average 8 m);
- Medium voltage cabling between turbines and the switching station, to be laid underground where technically feasible;
- Overhead medium voltage cables between onsite substations where necessary;
- Three onsite substation compounds of approximately 4 ha consisting of: onsite substation 1.1 ha, offices 0.5 ha, permanent laydown 1 ha, temporary construction yard (future battery storage) 1 ha; and
- 132 kV high voltage overhead power line from the onsite switching station to the Eskom Paulputs Substation or the existing 132 kV overhead powerline to the national grid.

The total size of the land portions within which the proposed development will be located is approximately 10 000 hectares (Figure 2). The footprint of the proposed development is estimated to be approximately 2 % of this area.

2.1 Construction Phase

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.

2.1.1 Turbines

The proposed Paulputs WEF will comprise of 75 turbines with a maximum generation capacity of 300 MW for the WEF. Approximately 80 km of internal roads will connect the turbines. Onsite cabling will largely follow the road infrastructure where possible, and will be either overhead, or underground, where technically feasible. Three onsite substation compound locations will form part of this application. Turbines will have a maximum height to blade tip of 230 m (a hub height of up to 140 m, and a rotor diameter of up to 180 m).

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.

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.

Turbines will be placed on steel and concrete foundations which will each occupy an area of approximately 450 m^2. The overall hardstanding area including foundation, crane pad, and temporary and permanent laydown area for each turbine will be approximately 0.8 hectares. The overall hardstanding construction footprint is estimated to a total of 60 hectares for a maximum of 75 wind turbines (0.8 ha x 75 turbines = 60 ha).

Once construction is complete, some of the hardstanding and laydown area can be rehabilitated.

2.1.2 Laydown Areas, Electrical Cabling and Onsite Substation

It is assumed that the permanent laydown area and the temporary construction laydown will form part of the 200 x 200 m substation compound. Battery technology may be stored in storage containers adjacent to the substation itself, probably in the 1 hectare area that will be the temporary laydown during construction. The three substation compounds options are 4 hectares each to allow for a 1.1 hectare substation, 0.5 hectare office block, 1 hectare permanent laydown and 1 hectare temporary laydown.

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 cabling. 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.

2.1.3 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 12 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.

2.1.4 Compound

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

2.1.5 Ancillary Equipment

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

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

2.1.6 Establishment of a Servitude

A servitude is by definition “the right to use someone else’s land for a specified purpose”, in this case the right to erect, operate and maintain a power line, as well as access rights to carry out these activities. Ownership of the land remains with the original landowner who signs a servitude agreement and keeps overall responsibility for the land.

A topographical survey will be conducted along the preferred alternative to inform the final route and design of the tower foundations, pylons and structures. Once the final servitude route has been confirmed construction of the power line begins. The servitude is generally cleared of wooded plant species and any protruding alien vegetation to reduce fire risk and prevent shortages with vegetation, in line with this EMPR and Eskom requirements and guidelines.

Although existing roads and tracks will be used as much as possible, access roads for minor vehicles may be created for the construction phase as well as for periodic maintenance, in negotiation with the relevant landowner.

2.1.7 Construction of Power Line Tower Structures

The type of structures which will support the overhead lines is yet to be determined and may include:

- Concrete, steel or wood monopoles;
- Guy line supported steel structures;
- Free standing metal lattice towers; or
- Multi-pole structures such as H-towers or K-towers.

The preferred type of tower is dependent on a variety of factors, including the terrain, cost, conductor size, live line compatibility and required electrical characteristics. Tower type selection will therefore be based on additional on-site investigations during the detailed design phase of the project. Similarly, the foundation size and type will depend on the type of tower selected as well as conditions of the local terrain. Tower steel is typically delivered on a 24-ton truck, or on smaller vehicles in difficult terrain. The tower structures are assembled on the ground and erected on the constructed foundations using an 8-ton crane truck. Following this the power lines and conductors are strung from tower to tower. The average span between two 132 kV towers is 200 m but can vary between 150 and 375 m depending on the terrain and ground profile.

2.1.8 Stringing High Voltage Cables

Power lines to be strung are delivered to the site on cable drums that are placed along the servitude at regular intervals. If the area is inaccessible these may be delivered by helicopter. A pilot cable is then laid down by a pilot tractor driven along the route of the power line. This is used to string the conductors between towers in sections from bend to bend by the means of a pulley system. The correct tension required to reduce sagging and comply with minimum clearance distances is then obtained before clamping the conductors and cutting off any excess cabling.

3 LEGAL FRAMEWORK

An application for Environmental Authorisation, in term of the National Environmental Management Act, Act 107, 1998 (NEMA), Environmental Impact Assessment Regulations, 2014, as amended has been submitted to the Department of Environmental Affairs. The environmental authorisation process that is being followed for the proposed development, is a full scoping and EIA process.

This section of the 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 below highlights the listed activities being applied for environmental authorisation.

Table 3.1: The NEMA EIA Regulations 2014, as amended Listed Activities Applicable to the Proposed WEF and Grid Connection

Listing Notices 1 - 3	*Listed Activity*	**Description of project activity that triggers listed activity**
Listing Notice 1 GN R 327 Activity 11	*The development of facilities or infrastructure for the transmission and distribution of electricity— (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.*	Electrical reticulation will be installed to transfer electricity from the turbines to an onsite substation. Cables will be installed underground where feasible. These internal transmission lines are expected to be of 33 kV capacity. 132 kV overhead powerlines will be installed to transfer electricity from the onsite substation to the existing Eskom substation.
Listing Notice 1 GN R 327 Activity 12	*The development of- (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs (a) within a watercourse (c) if no development setback exists within 32 m of a watercourse, measured from the edge of a watercourse*	Infrastructure such as roads is proposed within 32 m of a watercourse. The cumulative footprint of all proposed development within 32 m of a watercourse may exceed 100 square metres.
Listing Notice 1 GN R 327 Activity 14	*The development and related operation 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 or more but not exceeding 500 cubic metres.*	Construction of the proposed development will require dangerous goods in the form of hydrocarbon fuels (e.g. diesel), paints and solvents, oils and greases. Sewage and waste streams will be generated by the WEF. During construction of the WEF in particular the combined capacity of dangerous goods on site may exceed 80 cubic metres. The proposed onsite substation is likely to require the use of transformer oils/other hazardous substances during the operational phase.
Listing Notice 1 GN R 327 Activity 19	*The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;*	The construction of the overhead powerline could include the excavation of soil in watercourses/drainage line areas, and infilling/deposition may exceed 5 cubic metres and in some instances may exceed 10 cubic metres. Figure shows the location of water crossings.
Listing Notice 1 GN R 327 Activity 24	*The development of a road -* *(ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;*	Internal access roads of 12 m will be required between turbines.
Listing Notice 1 GN R 327 Activity 28	*Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development: (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.*	Construction of the proposed development will change the land use from agriculture to mixed - agriculture and electricity generation and transmission. The proposed development is outside an urban area and has a footprint that will exceed 1 ha.
Listing Notice 1 GN R 327	*The expansion of-*	Existing infrastructure such as roads and bridges within 32 m of a watercourse may require expansion. The cumulative footprint of all

Listing Notices 1 - 3	*Listed Activity*	Description of project activity that triggers listed activity
Activity 48	*Infrastructure or structures where the physical footprint is expanded by 100 square metres or more; where such expansion occurs- (a) within a watercourse; (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse*	proposed development expansion within 32 m of a watercourse may exceed 100 square metres.
Listing Notice 1 **GN R 327** **Activity 56**	*The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre -* *(ii) where no reserve exists, where the existing road is wider than 8 metres;*	Existing farm access roads may need to be widened or lengthened. These roads would currently have no road reserve and may be wider than 8 m in some areas.
Listing Notice 2 **GN R 325** **Activity 1**	*The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more.*	The WEF will consist of a number of wind turbines for electricity generation with a combined capacity of more than 20 MW.
Listing Notice 2 **GN R 325** **Activity 15**	*The clearance of an area of 20 hectares or more of indigenous vegetation.*	The construction of the proposed development will require the clearance of more than 20 hectares of indigenous vegetation in total across the site.
Listing Notice 3 **GN R 324** **Activity 4**	*The development of a road wider than 4 metres with a reserve less than 13,5 metres* *(g) Northern Cape* *(ii) Outside urban areas:* *(ee) Critical Biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;*	Internal and external access roads will be constructed, which are wider than 4 m. The site falls outside of an urban area and part of it falls within a CBA 1.
Listing Notice 3 **GN R 324** **Activity 12**	*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.* *(g) Northern Cape* *(ii) Within critical biodiversity areas identified in bioregional plans;*	The proposed development will require the clearance of natural vegetation in excess of 300 m^2 in areas of natural vegetation. Parts of the site fall within CBA 1.
Listing Notice 3 **GN R 324** **Activity 14**	*The development of—* *(ii) infrastructure or structures with a physical footprint of 10 square metres or more;* *where such development occurs—* *(a) within a watercourse;*	Bridges and infrastructure may be constructed within 32 m of watercourse(s). The site lies outside of an urban area and a portion of the site falls within a CBA 1.

Listing Notices 1 - 3	***Listed Activity***	**Description of project activity that triggers listed activity**
	(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; *(g) Northern Cape* *(ii) Outside urban areas:* *(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;*	
Listing Notice 3 **GN R 324** **Activity 18**	*The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.* *(g) Northern Cape* *(ii) Outside urban areas* *(ee) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;*	Existing farm roads may need to be widened or lengthened. The site lies outside of an urban area and a portion of the site falls within a CBA 1.
Listing Notice 3 **GN R 324** **Activity 23**	*The expansion of—* *(ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more;* *where such expansion occurs—* *(a) within a watercourse;* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;* *(g) Northern Cape* *(ee) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;*	The construction of the WEF may include the expansion of existing bridges over watercourses. The site lies outside of an urban area and a portion of the site falls within a CBA 1.

3.1 Legislative Requirement for Scope and Content of the EMPr

Table 3.2: Legislative Requirements for Scope of Assessment and Content of Environmental Management Programme

Appendix 4 Requirements NEMA, 1998 (Act No. 107 of 1998)		Location in EMPr
1	**Content of environmental management programme (EMPr)** *(1) An EMPr must comply with section 24N of the Act and include-*	Section 1.2 Appendix A
(a)	*details of-* *(i) the EAP who prepared the EMPr; and* *(ii) the expertise of the EAP to prepare an EMPr, including a curriculum vitae;*	
(b)	*A detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;*	Section 2
(c)	*a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitives of the preferred site, indicating any areas that should be avoided, including buffers;*	Figure 2
(d)	*a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment processed for all phased of the development including-* *(i) planning and design;* *(ii) pre-construction activities;* *(iii) construction activities;* *(iv) rehabilitation of the environment after construction and where applicable post closure; and* *(v) where relevant, operation activities;*	Sections 4 - 22
(f)	*a description of proposed impact management actions, identifying the manner in which the impact management outcomes and contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to-* *(i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;*	Sections 4 - 22
	(ii) comply with any prescribed environmental management standards or practices;	Sections 4 - 22
	(iii) comply with any applicable provisions of the Act regarding closure, whre applicable; and	Sections 4 - 22
	(iv) comply with any provisions of the Act regarding financial provision for rehabilitation, where applicable;	Sections 4 - 22
(g)	*the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);*	Sections 4 - 22
(h)	*the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);*	Sections 4 - 22
(i)	*an indication of the persons who will be responsible for the implementation of the impact management actions;*	Sections 4 - 22
(j)	*the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;*	Sections 4 - 22
(k)	*the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);*	Sections 4 - 22

Appendix 4 Requirements NEMA, 1998 (Act No. 107 of 1998)		Location in EMPr
(l)	*a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;*	Sections 4 - 22
(m)	*an environmental awareness plan describing the manner in which-* *(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and* *(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and*	Section 4
(n)	*any specific information that be required by the competent authority.*	Specific information required by the competent authority during the EIA process has been included throughout the EMPr.

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, 1998 (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 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 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 Northern Cape Environmental Department. 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 EMPr during the construction and operations phases, and for monitoring, reviewing and verifying compliance of the contractor with the EMPr, record-keeping and updating of the EMPr as and when necessary.

The ECO will:

- Be fully knowledgeable with the contents of the EMPr;
- Be fully knowledgeable with the contents of all relevant environmental legislation and ensure compliance with them;
- Ensure that the contents of the EMPr are communicated to the contractor, all site staff, the contractor and /or site manager are made aware of the contents of the EMPr, through presentations and discussions;
- Ensure that compliance to the EMPr 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 EMPr, 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 EMPr for the operation phase;
- Ensure that the necessary environmental monitoring takes place as specified in the EMPr;
- Update the EMPr 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 EMPr 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 EMPr 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 EMPr 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 EMPr. They shall know and understand the specifications of the EMPr and be able to assist other staff members in matters relating to the EMPr.

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, and
- 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 EMPr.

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 EMPR may be justified as failure to comply with instruction from the highest authority.

4.6 Dealing with Non Compliance with the EMPR

There may be difficulties encountered with carrying out the mitigation measures within the EMPr, this may result in non-compliance with the EMPr. It may be possible that the contractor and or the developer put in place procedures to motivate staff members to comply with the EMPr and to 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 EMPr Amendments and Instructions

No EMPr amendments shall be allowed without the approval of the DEA. Amendments may be possible, following discussions with the relevant ECO or environmental consultant, who may propose EMPr amendments on behalf of the developer or issue EMPr instructions, corrective actions, remediation or rehabilitation. These correction actions 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.
- To ensure the DEA has an amended EMPr to approve based on micro-siting and specialist input. The EMPr must contain the final site layout for approval.

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 must 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 must be drawn from the local market where possible.
- 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.

5.1 Final Site Assessment by Specialists

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;
- Bat specialist;
- Avifaunal specialist;
- Aquatic specialist; and
- Archaeologist.

Following the selection of turbine to be used for the project, the developer must update the layout plan / site development plan, this together with the following management plans, to be developed and / or updated, must be submitted to the DEA for approval:

- *Aloidendron dichotomum* Monitoring Plan – this plan will include measures to ensure the sustainability of the population of *Aloidendron dichotomum* during the lifecycle of the proposed development. It must include a population analysis prior to the commencement of construction provide measure to protect this species.
- Traffic / Transport 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.

Should any telephone communication lines require moving this will have to be facilitated and approved by Telkom.

The construction of the grid connection must involve consultation with existing neighbouring solar facilities, these consultations must include matters relating to dust, blasting activities and road maintenance. The agreements made between these parties must be incorporated into the updated EMPr.

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.

5.2 Method Statements

The Contractor shall provide Method Statements for approval by the ECO and the Engineer prior to work commencing on aspects of the project deemed or identified to be of greater risk to the environment and/or which may not be covered in sufficient detail in the construction phase of the EMPR, when called upon to do so by the Engineer or ECO.

A Method Statement is a “live document” in that modifications are negotiated between the Contractor and the ECO/project management team, as circumstances unfold. All Method Statements will form part of the construction phase of the EMPR documentation and are subject to all terms and conditions contained within the construction phase of the EMPR.

Note that a Method Statement is a ‘starting point’ for understanding the nature of the intended actions to be carried out and allows for all parties to review and understand the procedures to be followed in order to minimise risk of harm to the environment.

Changes to, and adaptations of Method Statements can be implemented with the prior consent of all parties.

A Method Statement describes the scope of the intended work in a step-by-step description in order for the ECO and the Engineer to understand the Contractors intentions. This will enable them to assist in devising any mitigation measures, which would minimize environmental impact during these tasks.

For each instance where it is requested that the Contractor submit a Method Statement to the satisfaction of the Engineer and ECO, the format must clearly indicate the following:

- What - a brief description of the work to be undertaken;
- How - a detailed description of the process of work, methods and materials;

- Where - a description/sketch map of the locality of work (if applicable); and
- When - the sequencing of actions with due commencement dates and completion date estimates.
- Who – The person responsible for undertaking the works described in the Method Statement;
- Why – a description of why the activity is required.

All Method Statements are to be to the satisfaction of the ECO, Engineer and, where practical and deemed necessary, should be endorsed as being acceptable by the environmental representative of the Relevant Authority.

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; and
- Hazardous materials management.

5.3 Permit Requirements

Activities undertaken during site preparation, construction and operation may require additional permits, over and above the Environmental Authorisation. Paulputs WEF RF (Pty) Ltd is responsible for ensuring that they hold the necessary permits in order to comply with national and local regulations. Additional permit requirements are described below.

5.3.1 Borrow Pits

A borrow pit refers to an open pit where material (soil, sand or gravel rock) is removed for use at another location. Paulputs Wind Energy Facility RF (Pty) Ltd or their contractors may want to use borrow pits for certain earthworks operations, such as the construction of roads, embankments, bunds, berms, and other structures.

The establishment of borrow pits is regarded as a mining activity and is legislated in terms of the Mineral and Petroleum Resources Development Act, 2002 (No. 28 of 2002) (MPRDA). A mining permit must be obtained from the Department of Minerals and Energy prior to the establishment of borrow pits on the site.

5.3.2 Water Use License

There are licensing procedures that need to be followed for particular “water uses”. Water uses that may be of relevance to the development and associated road construction include the following:

- Taking of water from a water resource, including a water course, surface water, estuary or aquifer (i.e. borehole)
- Altering the bed, banks, course or characteristics of a water course; and/or
- Impeding or diverting of a flow in a water course.

Under the National Water Act, 1998 (Act No. 36 of 1998), either General Authorisation or a Water Use Licence must be applied for.

5.3.3 Heritage

Should any archaeological or palaeontological site or any meteorite be found during construction the South Africa Heritage Resource Agency must be contacted. No archaeological or palaeontological site or any meteorite site may be destroyed or moved without a permit.

- A report detailing the results of the recommended walkdowns of the final layouts of the powerline and WEF must be compiled by a qualified archaeologist and submitted to SAHRA for comment once completed.
- If heritage resources are uncovered during the course of the development, a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the heritage resource. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA.
- If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted as per section 35(3) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule.
- If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule.

The following conditions apply with regards to the appointment of specialists:

- If heritage resources are uncovered during the course of the development, a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the heritage resource. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA.

5.3.4 Vegetation Search and Rescue

Under the Forests Act, 1998 (Act No. 84 of 1998) (NFA), a license must be applied for from the Department of Agriculture, Forestry and Fisheries (DAFF) for the removal or disturbance of any protected trees on the site, in terms of the List of Protected Tree Species promulgated under the NFA.

Permits are needed for any damage/removal/movement/transport of specially protected [(Regulation 49(1) (a) and (d)] and protected species [(Regulation 50 (1) (a) and (d)] in terms of the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCA). Permits are also needed for instances where indigenous plant species are impacted up to 100 m from middle of the roads and rivers [(Regulation 51 (1)] or for large scale clearing [(Regulation 51 (2)] in terms of the NCA.

5.4 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[1]. 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.);
- 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 rehabilitated upon completion of the construction period, providing measures to be used for rehabilitation.
- 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 must be secure so as to minimize the risk of crime. They must 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).

[1] To form part of the Project Layout and Access Plan.

- These pollution prevention measures for storage must include a bund wall high enough to contain at least 110% of any stored volume, and this must be sited away from drainage lines on 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 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 must 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 must 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.

5.4.1 Site Clearance

Vegetation clearance must preferably be phased as required to work in certain areas, rather than clearing of the entire site initially. If this is not practical and the entire site is cleared at the start of the contract, it is to be stabilized immediately to control dust. Wherever possible, vegetation shall be trimmed rather than cleared.

Cleared vegetative material is not to be dumped anywhere other than an approved waste disposal site or an area as agreed to with the ECO.

Wherever possible and where the material is suitable, the material must be chipped for later use as mulch in landscaped areas or for stabilization purposes or it must be dumped at a green waste recycling depot for compost production.

Invasive alien plant species, which are removed from the site, are not to be chipped for mulch if they are in a seed bearing state. Such material is to be disposed of at a suitable waste disposal site. Wherever possible, suitable larger stumps must be made available to the local community as firewood.

Plant material removed from the site is not to be burnt for disposal on site unless a burning permit has been obtained from the local authority.

Sensitive ecosystems in the vicinity of the areas of construction must be demarcated (e.g. using danger tape or droppers) prior to any construction activities, so that these can be avoided.

Removal of vegetation must be kept to a minimum, and cleared areas must be re-vegetated after clean-up. A detailed planting plan must be developed, in consultation with a landscaper and ecologist.

Minimise the development footprint as far as possible and rehabilitate disturbed areas that are no longer required by the operational phase of the development

Demarcate all areas to be cleared with construction tape or similar material. However, caution must be exercised to avoid using material that might entangle fauna.

An alien control and monitoring program must be developed to ensure that the site is cleared of alien plants (as listed under the Conservation of Agricultural Resources Act 43 of 1983 - as amended/updated) and kept free from alien plants for the duration of the construction phase.

A low cover of vegetation must be left wherever possible within the construction footprint to bind the soil, prevent erosion and promote post-disturbance recovery of an indigenous ground cover.

5.4.2 Topsoil

Topsoil / top material shall be removed from all areas cleared of vegetation and retained for future landscaping use, where feasible. Top material must exclude litter, building rubble, alien plant material or any other waste.

All topsoil, and specifically any topsoil from areas which are likely to contain bulbs, must be stripped and stockpiled for re-use in rehabilitation. This will constitute at least a 300mm layer.

Topsoil shall be stored in areas demarcated by the ECO and Engineer and in piles not higher than 2 m, and may not be removed from site, or used for any purpose other than in the rehabilitation of the site post-construction. The stockpiles shall not be compacted or disturbed, and shall be domed at the top to promote runoff. The period between the stockpiling of topsoil and its utilization shall be as short as possible, and ideally the topsoil must be transferred to its intended site of use immediately following site clearance and stockpiling. This would also avoid double handling.

Stockpiles that are to be stored for less than three months must be covered with shade-cloth or Geotech fabrics or similarly suitable material to prevent erosion. If stockpiles are to be stored for more than 3 months a protective vegetation layer must be established to cover topsoil stockpiles in order to protect them against erosion and desiccation. If possible, the stockpile must be kept moist in order to maintain the vitality of the vegetation. Vegetation may not consist of weeds, but must comprise of grass or ground covers.

5.5 Design Phase Mitigation Measures

Table 5.1 PRECONSTRUCTION / DESIGN PHASE MITIGATION MEASURES

Mitigation Measure	Responsibility	Timing / Frequency
Impacts on Vegetation and Listed or Protected Plant Species Resulting from Construction Activities		
Preconstruction walk-through of the approved development footprint by a qualified specialist to ensure that sensitive habitats and species are avoided where possible.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction. Monthly thereafter.
Search and Rescue of species of conservation concern (SCCs) must be conducted prior to clearing activities.	ECO to monitor Site engineer/site manager	Preconstruction.
Vegetation clearing to commence only after walk through has been conducted and necessary permits obtained.	ECO to monitor Site engineer/site manager	Pre-construction. 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	Pre-construction. Monthly thereafter.
Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared.	ECO to monitor Site engineer/site manager	Pre –construction. During site establishment Monthly thereafter.
Temporary lay-down areas must be located within previously transformed areas or areas that have been identified as being of low sensitivity. These areas must be rehabilitated after use.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Ensure that lay-down and other temporary infrastructure is within low- sensitivity areas.	ECO to monitor Site engineer/site manager	Design Phase During site establishment
Minimise the development footprint as far as possible and rehabilitate disturbed areas that are no longer required by the operational phase of the development.	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment and post construction
The exact routing of the roads must be adjusted where necessary to avoid features of higher sensitivity such as rocky outcrops, as informed by the preconstruction walk-through of the facility.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Design Phase Pre-Construction ECO to monitor throughout construction.

Mitigation Measure	Responsibility	Timing / Frequency
Demarcate sensitive areas in close proximity to the development footprint as no-go areas with construction tape or similar and clearly mark as no-go area	Developer / Site Engineer ECO to monitor Site engineer/site manager	Design Phase Pre-Construction ECO to monitor throughout construction.
Wherever excavation is necessary, topsoil must be set aside and replaced after construction to encourage natural regeneration of the local indigenous species. The recovery of the indigenous shrub/grass layer must 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 must be conducted using the best-practice methods for the species concerned. The use of herbicides must be avoided as far as possible.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Throughout operation. Monthly checks
Alien Plant Invasion Risk		
An alien plant management plan must be submitted as part of the EMPR to be approved by the DEA and implemented on site.	ECO to monitor Site engineer/site manager	Design Phase Pre-Construction ECO to monitor throughout construction.
Regular alien clearing must be conducted using the best-practice methods for the species concerned. The use of herbicides must be avoided as far as possible.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Increased Erosion Risk and Soil Degradation		
Dust suppression and erosion management must be an integrated component of the construction approach.	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 must 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.

Mitigation Measure	Responsibility	Timing / Frequency
Disturbance near to drainage lines or the pan must be avoided and sensitive drainage areas near to the construction activities must be demarcated as no-go areas.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Implement an effective system of storm water run-off control using bunds and ditches, where it is required - that is at all points of disturbance where water accumulation might occur. The system must effectively collect and safely disseminate any run-off water from all hardened surfaces and it must prevent any potential down slope erosion.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Design Phase Pre-Construction ECO to monitor throughout construction.
Direct Faunal Impacts		
All personnel must 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.
Preconstruction walk-through of the facility to identify areas of faunal sensitivity such as occupied burrows	Developer ECO to monitor Site manager	Pre- construction.
Any fauna threatened by the construction activities must be removed to safety by the ECO or appropriately qualified environmental officer.	ECO to monitor Site engineer/site manager	During site establishment Weekly.
The illegal collection, hunting or harvesting of any plants or animals at the site must be strictly forbidden. Personnel must not be allowed to wander off the construction site.	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment Weekly.
If any parts of site such as construction camps must be lit at night, this must be done with low-UV type lights (such as most LEDs) as far as practically possible, which do not attract insects and which must be directed downwards	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
No unauthorized persons must be allowed onto the site and site access must be strictly controlled.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Weekly.
All construction vehicles must adhere to a low speed limit (40km/h for cars and 30km/h for trucks). Speed limits must apply within the facility as well as on the public gravel access roads to the site.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Weekly.

<table>
<tr><th>Mitigation Measure</th><th>Responsibility</th><th>Timing / Frequency</th></tr>
<tr><td>All hazardous materials must be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site must be cleaned up in the appropriate manner as related to the nature of the spill.</td><td>ECO to monitor
Site engineer/site manager</td><td>During site establishment
Monthly thereafter.</td></tr>
<tr><td colspan="3">Loss of Rare, Endemic or Protected Species</td></tr>
<tr><td>A final pre-construction walkdown must be conducted, as part of a Plant Search and Rescue plan, with the appropriate permits in place.</td><td>Developer / Site Engineer
ECO to monitor
Site engineer/site manager</td><td>Pre-construction / design phase.</td></tr>
<tr><td>Where any roads and crossings will be upgraded, the following applies:
1. All pipe culverts must be removed and replaced with suitably sized box culverts, where road levels are raised.
2. River levels, regardless of the current state of the river / water course will be reinstated thus preventing any impoundments from being formed. The related designs must be assessed by an aquatic specialist during a post authorisation walkdown, prior to commencement of the construction phase.
3. Approach road embankments especially where large cut and fill areas will be required must be rehabilitated during the construction process, to minimise erosion.
Suitable stormwater management systems must be installed and monitored during the first few months of use. Any erosion / sedimentation must be prevented.</td><td>Developer / Site Engineer
ECO to monitor
Site engineer/site manager</td><td>Pre-construction / design phase.
During site establishment.
Monthly thereafter.</td></tr>
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Mitigation Measure	Responsibility	Timing / Frequency
	Site engineer/site manager	
Avifaunal Habitat Destruction		
High traffic areas and buildings such as offices, batching plants, storage areas etc. must be situated in areas that are already disturbed, if available.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction / design phase.
Existing roads and farm tracks must be used where possible.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction / design phase.
The minimum footprint area possible of infrastructure must be used, including road widths and lengths.	ECO to monitor Site engineer/site manager	Prior to construction
During construction laydown areas and temporary access roads must 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.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Highly sensitive zones and no-go areas (e.g. nesting areas) must be cordoned off, clearly marked and avoided unless absolutely necessary.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
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 within which construction activities need to be excluded and/or the schedules adjusted.	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
All contractors are to adhere to the EMPr and must apply good environmental practice during construction.	ECO to monitor Site engineer/site manager	Throughout construction
Turbines must not be constructed within any High Sensitivity Zones	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction
Disruption of Local Bird Movement Patterns		
Turbines must not be constructed within any high sensitivity zones identified through pre-construction monitoring and impact assessment.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction

Mitigation Measure	Responsibility	Timing / Frequency
The lowest feasible number of turbines should be constructed for the required MW output. Therefore, fewer larger (i.e with a higher MW output) turbine models should be favoured where possible.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction
Lighting on turbines to be of an intermittent and coloured nature rather than constant white light to reduce the possible impact on the movement patterns of nocturnal migratory species.		
Avifaunal Disturbance and Displacement		
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/roosting activity of sensitive species, as well as any additional sensitive habitats. The results must inform the final construction schedule, including abbreviating construction time, scheduling activities around avian breeding and/or movement schedules, and lowering levels of associated noise.	ECO to monitor Site engineer/site manager	Monthly and when required.
During Construction, if any of the Priority Species or Red Data species identified in this report are observed to be roosting and/or breeding in the vicinity (within 500 m of the power line), the Avifaunal Specialist is to be contacted immediately for further instruction, while a ‘no go’ buffer of 300 m is to be instituted around the nest site until the specialist has given further instructions.	ECO to monitor Site engineer/site manager	Pre-construction, post final design
No nests are to be disturbed or moved.	ECO to monitor Site engineer/site manager	As per specialist requirements.
Sensitive zones and no-go areas are to be designated by the specialist (e.g. nesting sites) and must be clearly marked, cordoned off and avoided unless absolutely necessary.	Developer / Site Engineer ECO to monitor Site engineer/site manager	As per specialist requirements.
Bird collisions		
Attach appropriate marking devices (BFDs) on overhead power lines to increase visibility. The advice of a specialist must be sought regarding the type, placement and spacing of the BFDs to be used.	Developer / Operator to implement. Specialists to be appointed. ECO to Monitor.	Pre-Construction Design Phase.
Any new 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 and possible bird perches (e.g. cross arms) of 1.8 m or greater. Each pylon must be fitted with a safe bird perch.	Developer / Operator to implement. Specialists to be appointed. ECO to Monitor.	Pre-Construction Design Phase.

Mitigation Measure	Responsibility	Timing / Frequency
Lighting on turbines to be of an intermittent and coloured nature rather than constant white light to reduce the possible impact on the movement patterns of nocturnal migratory species.	Developer / Operator to implement. ECO to Monitor.	Pre-Construction Design Phase.
Any new overhead power lines must be of a design that minimizes electrocution risk by using adequately insulated 'bird friendly' structures, with clearances between live components of 1.8 m or greater and which provides a safe bird perch. A replica or 'mock up' of the exact pole structures (including bend point structures), or at least a 3D model simulation that specifically shows how the jumpers will be placed and insulated, must be examined and approved by the bird specialist in consultation with EWT.	Developer / Operator to implement. ECO to Monitor.	Pre-Construction Design Phase.
Place new internal power lines on the WEF underground where possible and technically feasible.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-Construction Design Phase.
Where possible place new overhead power lines adjacent to existing power line or linear infrastructure (e.g. roads and fence lines).	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-Construction Design Phase.
Electrical infrastructure is not to be constructed in 'no-go' areas	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-Construction Design Phase.
The shortest possible grid connection route is the preferred alternative, unless it runs along existing infrastructure, in which case a longer route is deemed acceptable if it is constructed in such way that the pylons of the new grid connection are 'staggered' and fall between the pylons of the existing lines as far as possible	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-Construction Design Phase.
Bat Roost Disturbance and/or Destruction		
Designing the layout of the project to avoid areas that are more frequently used by bats may reduce the likelihood of mortality and must be the primary mitigation measure. Low lying areas, buildings, woodland/thicket and areas near water must be avoided.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction / design phase.
It is recommended that a bat specialist survey the confirmed turbine locations and all other proposed site infrastructure for the presence of roosts within 200 m before any construction activities commence and once the preliminary design and layout of each WEF is complete.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction / design phase.

Mitigation Measure	Responsibility	Timing / Frequency
It is recommended that a bat specialist surveys the confirmed turbine locations and the locations of all other site infrastructure, such as pylons, for the presence of occupied roosts among the potential roosts before any construction activities commence and once the preliminary design and layout of the site is complete.	Developer to appoint ECO to monitor Site engineer/site manager	Pre-construction / design phase.
If occupied roosts are confirmed these must be buffered based on best practise guidance, which includes a minimum buffer of 200 m.	Developer ECO	Pre-construction / 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.
Dust suppression measures to be used during the full construction phase.	ECO to monitor Site engineer/site manager	Weekly
Any new roosts discovered, must be reported and incorporated into the adaptive management plan.	ECO to monitor Site engineer/site manager	Monthly and as required during construction
Bat Habitat Modification		
Clearing of natural and agricultural areas be kept to a minimum	ECO to monitor Site engineer/site manager	Pre-construction / design phase. Monthly thereafter.
Before construction commences, a bat specialist must conduct a site walkthrough, covering the final road and power line routes as well as the final turbine positions.	Developer to appoint ECO to monitor Site engineer/site manager	Pre-construction / design phase.
During construction laydown areas and temporary access roads must 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	ECO to monitor Site engineer/site manager	Pre-construction / design phase.
Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and a habitat restoration plan must be developed by a specialist	ECO to monitor Site engineer/site manager	Pre-construction / design phase.
Where lights need to be used such as at the substation and switching station and elsewhere, these should have low attractiveness for insects such as low pressure sodium and warm white LED lights (Rydell 1992; Stone 2012). High pressure sodium and white mercury lighting is attractive to insects (Blake et al. 1994; Rydell 1992; Svensson & Rydell 1998) and should not be used as far as possible	Site engineer/ site manager Developer to implement ECO	Monthly thereafter.

Mitigation Measure	Responsibility	Timing / Frequency
Bats must be prevented from entering any possible artificial roost structures (e.g. roofs of buildings, road culverts and wind turbines) by ensuring that they are sealed in such a way as to prevent bats from entering. If bats colonise WEF infrastructure, a suitably qualified bat specialist must be consulted before any work is undertaken on that infrastructure or attempting to remove bats. Ongoing maintenance and inspections of buildings must be carried out to ensure no access to bats or actively roosting bats.	Site engineer/ site manager. Developer to implement. Specialist to be appointed. ECO to monitor.	Pre-construction / design phase.
Increasing the spacing between lights, and the height of light units can reduce the intensity and volume of the light to minimise the area illuminated and give bats an opportunity to fly in relatively dark areas between and over lights.	Site engineer/ site manager Developer to implement ECO	Monthly thereafter.
Lighting should be fitted with movement sensors to limit illumination and light spill, and the overall lit time. In addition, the upward spread of light near to and above the horizontal plane should be restricted and directed to minimise light trespass and sky glow.	Site engineer/ site manager Developer to implement ECO	Pre-construction / design phase.
The height of the lower blade swept area must be maximised.	Site engineer/ site manager Developer to implement	Pre-construction / design phase.
Loss of Riparian Systems and Disturbance of the Alluvial Watercourses		
Where new 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 (reduce footprint as much as possible).	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
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.
Vegetation clearing should occur in in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
It is also advised that an Environmental Control Officer (ECO), with a good understanding of the local flora be appointed during the construction phase. The ECO should be able to make clear recommendations with regards to the re-vegetation of the newly completed / disturbed areas within aquatic environment, using selected species detailed in this report	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		

Mitigation Measure	Responsibility	Timing / Frequency
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.
Vegetation clearing should occur in in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
No stormwater runoff must be allowed to discharge directly into any water course along roads, and flows should thus be allowed to dissipate over a broad area covered by natural vegetation	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Stormwater from hard stand areas, buildings and substation must be managed using appropriate channels and swales when located within steep areas or have steep embankments.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Increase in Sedimentation and Erosion within the Development Footprint		
Any storm-water within the site must be handled in a suitable manner, i.e. trap sediments and reduce flow velocities. Any management actions must be dealt with in the Stormwater Management Plan (SWMP) typically submitted post EA, forming part of any WULA.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Impact on Localized Surface Water Quality		
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.
Working protocols incorporating pollution control measures (including approved method statements by the contractor) must 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 must be provided for construction workers during construction and on-site staff during the operation of the facility (generally accepted 1:14 separate male and female facilities).	ECO to monitor Site engineer/site manager	Pre-construction. During site establishment. Weekly
Potential Visual Effect of Construction Activities, including Cranes, Construction Traffic, Dust and Noise Affecting the Rural Sense of Place		
Carefully plan to mimimise the construction period and avoid construction delays	Site engineer/site manager	Design phase
Inform receptors of the construction programme and schedules	ECO to monitor Site engineer/site manager	Design phase
Minimise vegetation clearing and rehabilitate cleared areas as soon as possible.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.

Mitigation Measure	Responsibility	Timing / Frequency
Vegetation clearing should take place in a phased manner.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Maintain a neat construction site by removing rubble and waste materials regularly.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Make use of existing gravel access roads where possible	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Limit the number of vehicles and trucks travelling to and from the proposed site, where possible	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Unless there are water shortages, ensure that dust suppression techniques are implemented – on all access roads; – in all areas where vegetation clearing has taken place; – on all soil stockpiles.	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.
Damage or Destruction of Archaeological Resources During Clearing of the Ground or Excavation of Foundations		
A final walk-down survey of the authorised footprint must be carried out at least 6 months before the start of construction in order for any archaeological mitigation requirements to be determined and carried out.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.

Mitigation Measure	Responsibility	Timing / Frequency
During the construction phase a chance-finds procedure must 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, so that appropriate action can be taken by a professional palaeontologist	When required during construction
If any archaeological material or human burials are uncovered during the course of development then work in the immediate area must be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Throughout construction. Weekly checks.
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.
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.
A minimum 30 m buffer to be maintained around all graves, ruins and buildings	ECO to monitor Site engineer/site manager	Pre-construction and throughout construction
Creation of Local Employment, Training, and Business Opportunities		
The project proponent of Paulputs WEF should liaise with the Khâi-Ma and Kai !Garib Local Municipalities to establish a local skills database for the associated areas. The existence of such a skills database should be made available to the contractors before the commencement of the construction phase to establish the extent of the available service providers in the local municipalities	Developer/ site manager	Pre-construction and throughout construction
The key stakeholders, local authorities and the community need to be informed regarding the outcome of the decision of the Paulputs WEF. The potential employment opportunities and the employment procedure that the project proponent intends to follow should be clearly communicated before the commencement of the construction phase	Developer/ site manager	Pre-construction and throughout construction

Mitigation Measure	Responsibility	Timing / Frequency
Reasonable and practical efforts should be made by the project proponent to appoint local contractors by implementing a "locals first" policy. However, due to the technical nature of this project it is likely that skilled positions will be filled by people from outside the local areas	Developer/ site manager	Pre-construction and throughout construction
Where feasible a training and skills development programmes for local workers must be initiated prior to the initiation of the construction phase	Developer/ site manager	Pre-construction and throughout construction
Efforts should be made to employ local contractors first, and also contractors that are compliant with the Broad Based Black Economic Empowerment (BBBEE) criteria.	Developer/ site manager	Pre-construction and throughout construction
The recruitment selection process should also seek to promote gender equality.	Developer/ site manager	Pre-construction and throughout construction
If feasible training and skills development programmes for the local workers should be initiated prior to the initiation of the construction phase of the Paulputs WEF.	Developer/ site manager	Pre-construction and throughout construction
Impacts of Construction Workers on Local Community and Influx of Job Seekers		
The project proponent should implement a "locals first" policy, where the local community of Pofadder and Kakamas should be employed first, specifically for un-skilled and low-skilled employment opportunities.	Developer/ site manager	Pre-construction and throughout construction
The project proponent should implement a policy that no employment opportunities will be available at the gate.	Developer/ site manager	Pre-construction and throughout construction
The proposed construction site for the Paulputs WEF should be clearly fenced off for potential security risks in this regard.	Developer/ site manager	Pre-construction and throughout construction
It should be noted that although the significance of this impact is low, the influx of job seekers can not be avoided or prevented.	Developer/ site manager	Pre-construction and throughout construction
The project proponent and appointed contractors need to develop a code of conduct which must be signed by construction workers prior to the construction phase. The code of conduct should clearly outline the acceptable behaviour and activities of construction workers. In doing so construction workers will be legally informed and held liable for any damages or losses. It is however important that dismissals or fines must comply with the South African labour legislation.	Developer/ site manager	Pre-construction and throughout construction
The proposed site for the Paulputs WEF should be clearly demarcated and fenced off to effectively monitor the movement of construction workers in the vicinity of the project site.	Developer/ site manager	Pre-construction and throughout construction
Transportation for the construction workers need to be arranged by the project proponent on a daily basis, and enable the proponent to effectively monitor the movement of construction workers to and	Developer/ site manager	Pre-construction and throughout construction

Mitigation Measure	Responsibility	Timing / Frequency
from the project site. Where necessary arrangements need to be made by the project proponents to enable construction workers to return to their hometowns over weekends/on a regular basis to reduce the potential risks posed to local family structures and social networks.		
No staff should be accommodated over-night on the construction site, except for the presence of security staff throughout the night on site due to security reasons for the landowners and their workers.	Developer/ site manager	Pre-construction and throughout construction
HIV/AIDS awareness programmes should be implement by the project proponent for the construction workers during the construction phase.	Developer/ site manager	Pre-construction and throughout construction
Maximising of opportunities to local and regional SMMEs and other businesses for service delivery.		
The project proponent of Paulputs WEF should liaise with the Khâi-Ma and Kai !Garib Local Municipalities to establish a database for the local companies/service providers of the associated areas. This database should be made available to the contractors before the initiation of the construction phase to notify and invite such service providers to tender for project-based services. However, it should be noted that a competitive tender process may not guarantee the employment of local service providers/companies and this should also be clearly communicated to potential contractors.	Developer/ site manager	Pre-construction and throughout construction
Efforts should be made by the project proponent to assist local Broad Based Black Economic Empowerment (BBBEE) companies regarding the application and submission of tenders.	Developer/ site manager	Pre-construction and throughout construction
Strategies need to be identified by the local municipalities and the local business sectors, in order to maximise the potential benefits which can be associated with the establishment of the Paulputs WEF	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 proposed construction site for the Paulputs WEF should be clearly fenced off and the movement of construction workers should be limited to the vicinity of the construction site	Developer/ site manager	Pre-construction and throughout construction
The project proponent/ appointed contractors should provide transportation to the construction workers on a daily basis. This will ensure the potential risk regarding the trespassing of construction workers on farmers' properties, be reduced.	Developer/ site manager	Pre-construction and throughout construction
The project proponent and appointed contractors need to develop a code of conduct which must be signed by construction workers prior to the construction phase. The code of conduct should clearly outline the acceptable behaviour and activities of construction workers. In doing so construction workers will be legally informed and held liable for any damages/theft. Construction workers found	Developer/ site manager	Pre-construction and throughout construction

Mitigation Measure	Responsibility	Timing / Frequency
guilty of such an offence should be charged and dismissed. It is however important that dismissals or fines must comply with the South African labour legislation.		
The project proponent should enter into an agreement with the farmers prior to the construction phase, whereby the damages/losses to farming property/infrastructure be compensated for, if it can be proven to be associated with the construction activities of the proposed WEF.	Developer/ site manager ECO to monitor	Pre-construction and throughout construction
The project proponent should hold the appointed contractors liable for the compensation to farmers for any damages or losses that can be associated with the construction phase of the proposed project. This should also be included in the Code of Conduct signed by all key stakeholders.	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 must 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
Procedures regarding waste management on the construction site should be clearly outlined in the Environmental Management Programme (EMPr), to reduce the risk it poses to livestock.	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		
Firebreaks must be implemented by the contractor around the perimeters of the construction site.	Developer/ site manager	Pre-construction and throughout construction
The project proponent should enter into an agreement with the farmers prior to the construction phase, whereby the damages/losses to farming property/infrastructure due to fire risks be compensated for, if it can be proven to be associated with the construction activities of the proposed WEF.	Site engineer/ site manager Safety officer	Pre-construction and throughout construction
In the event of a fire due to construction related activities, the contractor must repair any damages caused to the farmers. The farmers need to be compensated for any damages caused due to fires borne during construction related activities. The costs with regards to firefighting should also be borne by the contractor.	Developer/ site manager ECO to monitor	Daily. Pre-construction and throughout construction
The necessary precautionary measures need to be taken during high wind conditions and dry months	Site engineer/ site manager Safety officer	Pre-construction and throughout construction
The appointed contractors should ensure that any construction related activities that might pose potential fire risks, for example welding and grinding, are confined to the designated areas and that it is properly managed.	Site engineer/ site manager Safety officer	Pre-construction and throughout construction

Mitigation Measure	Responsibility	Timing / Frequency
Adequate fire-fighting equipment should be provided by the contractors and should be readily available and serviced on a regular basis. Additionally, all staff should be training in fire-fighting and how to use the related fire-fighting equipment.	Site engineer/ site manager Safety officer	Pre-construction and throughout construction
The appointed contractor should ensure that no open fires for the use of cooking or heating should be allowed, except for designated areas.	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 inform local farmers and representatives from the local and district municipality, of dates and times when abnormal loads will be undertaken.	Site engineer/ site manager Safety officer and ECO	Pre-construction and throughout construction
The contractor and developer must liaise with nearby solar farms to minimise potential impacts (e.g. minimise dust generation near existing solar farms and prevent damage to roads or other existing infrastructure).	Developer / Site engineer/ site manager Safety officer and ECO	Pre-construction and throughout construction
The contractor must ensure that damage caused by construction related traffic to the gravel public roads and local, internal farm roads is repaired on a regular basis throughout the construction phase. The costs associated with the repair must be borne by the contractor.	Developer/ site manager ECO to monitor	Daily. Pre-construction and throughout construction
Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis[2], adhering to speed limits and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.	Developer/ site manager ECO to monitor	Daily. Pre-construction and throughout construction
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 must 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 must 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 must be fined.	Site engineer/ site manager Safety officer and ECO	Daily. Pre-construction and throughout construction

[2] Treated effluent (non-potable) water must be used for wetting of roads and construction areas

Mitigation Measure	Responsibility	Timing / Frequency
The Contractor must 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 must be transported to the registered landfill.	Site engineer/ site manager ECO	Weekly throughput construction
EMPR measures (and penalties) must 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
EMPR measures (and penalties) must 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
As far as possible, the transport of components to the site along the national road must be planned to avoid weekends and holiday periods	Developer/ site manager ECO to monitor	Daily. Pre-construction and throughout construction
The loss of farmlands for grazing of sheep and on associated farming activities		
The location of wind turbines, access roads, laydown areas etc. must be informed by the findings of key specialist studies, including the soil and botanical study. In this regard areas of high potential agricultural soils must be avoided;	Site engineer/ site manager Developer to implement ECO	Weekly. Pre-construction and throughout construction
In addition, the project proponent should consult with the affected land owners for their inputs and comments on the finalization of the layout of the wind turbines and associated infrastructure, in order for landowners to factor in the construction activities and the impact thereof on their farmlands and farming activities	Site engineer/ site manager Developer to implement ECO	Weekly. Pre-construction and throughout construction
The proposed site for the Paulputs WEF should be clearly demarcated and fenced-off prior to the construction phase. All construction related activities must be confined to this area	Site engineer/ site manager Developer to implement ECO	Weekly. Pre-construction and throughout construction
The implementation of a rehabilitation programme must be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme must be drawn up the Environmental Consultants appointed to undertake the EIA;	Site engineer/ site manager Developer to implement ECO	Tender phase
The footprint of the impact associated with the construction phase need to be kept to the minimum, and sheep need to be relocated to alternative farmlands for the period of the construction phase.	Site engineer/ site manager Developer to implement	Weekly

Mitigation Measure	Responsibility	Timing / Frequency
	ECO	
It is advised that the construction phase take place in two phases and also to start with construction from one part of the site and gradually work the construction thereof through to the other part of the site to ensure that the disturbance to the landowners and their farming activities are kept to the minimum.	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Monthly
All impacted areas disturbed during the construction phase must be rehabilitated at the end of the construction phase. Rehabilitation plans need to be informed by the soil and agricultural specialist studies.	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Daily
An Environmental Control Officer (ECO) must be appointed to continuously monitor the activities associated with the construction phase. The ECO should also apply social monitoring on a quarterly basis and monitor the implementation of the Rehabilitation Programme.	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Monthly
A Rehabilitation Programme should be implemented by the project proponents. The specifications hereof should be compiled by the appointed EIA practitioners and must be included in the project proponents terms of reference and also be included in the EMPr.	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Monthly
In the case where a farmer experience permanent loss of farmland due to the construction of the proposed Paulputs WEF, the project proponents should compensate the farmer for the loss of the farmland as in the nature of the agreement made to the affected landowners.	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Monthly
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	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Weekly

Mitigation Measure	Responsibility	Timing / Frequency
• Globes and fluorescent tubes • Rubber waste • Medical waste • Chemical waste • Hazardous waste		
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 must 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
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
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

Mitigation Measure	Responsibility	Timing / Frequency
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 must 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 must 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 condoms. The distribution of condoms must be approached with the necessary cultural sensitivity.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Access at the construction site must 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 must 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		

Mitigation Measure	Responsibility	Timing / Frequency
Construction activities should be limited to times agreed with the local municipalities	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
Deliveries of turbine components, plant and materials by HGV to site should only take place by designated routes and within times agreed with the relevant authorities	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Daily
The site contractors should employ the best practicable means of reducing noise emissions from plant, machinery and construction activities, as described in BS 5228	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 must be limited, blasting must be undertaken at the same times each day and no blasting must 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 must liaise with local residents on how best to minimise impact, and the local population must 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 practicable, the work programme should be phased, which would help to reduce the combined effects arising from construction operations	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Daily

Mitigation Measure	Responsibility	Timing / Frequency
Where practicable, noise from fixed plant and equipment should be contained within suitable acoustic enclosures or behind acoustic screens	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Construction activities must 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. Daily
Any plant and equipment normally required for operation at night (19:00 - 07:00), e.g., generators, should be suitably screened or located such that noise levels from the plant do not exceed 45 dB, LAeq at the nearest noise-sensitive receptors.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Monthly checks.
Traffic Congestion, Impedance to Traffic Flow due to Increase in Traffic Volumes		
Transport Management Plan to be produced to include: • Ensure safe transport of materials, equipment, etc. to site; • Optimise route selection and time of travel; • Co-ordinate traffic law-enforcement and transport to site; • Design on-site roads to facilitate access to laydown areas, substations and wind turbines; • Conduct a dry-run prior to implementation of the Transport Management Plan.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Design Phase / Pre-construction
Minor Road Degradation due to Increased Traffic		
Document condition of gravel roads prior to construction.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Monthly checks.
Upgrade gravel roads to suitable condition for proposed construction vehicles.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Monthly checks.
Ensure that the minor road is left in a better condition post-construction.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Monthly checks.
Intersection Road Safety		

Mitigation Measure	Responsibility	Timing / Frequency
Place warning construction vehicle signage on the N14 and MN759.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Monthly checks.
Ensure that all construction vehicles are roadworthy.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Monthly checks.
Ensure that all construction vehicles have appropriate drivers licence.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Monthly checks.

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; and
- No alcohol or drugs are allowed on site.

6.1 Eating Areas

The Contractor shall designate eating areas to the approval of the Engineer which shall be clearly demarcated. Sufficient bins, as specified in 4.5.4a shall be present in this area. Any cooking on Site shall be done on well-maintained gas cookers with fire extinguishers present.

6.2 Drinking Water

The Contractor shall ensure that drinking water is available for all staff on site. If no potable water source is available on site then the Contractor shall import drinking water to the site.

6.3 Contaminated Water

Water containing such pollutants as cements, concrete, lime, chemicals, fuels and hydrocarbons shall be contained and discharged into an impermeable storage facility for removal from the site or for recycling. This particularly applies to water emanating from concrete batching plants and concrete swills, and to runoff from fuel depots/workshops/truck washing areas.

Wash down areas shall be placed and constructed in such a manner so as to ensure that the surrounding areas are not polluted. The Contractor shall notify the Engineer immediately of any pollution incidents on Site.

If construction areas are to be pumped of water (e.g. after rains), this water must first be pumped into a settlement area, and not directly into a natural ecosystem.

A Method Statement shall be required for all wash areas where hydrocarbon and hazardous materials, and pollutants are expected to be used. This includes, but is not limited to, vehicle washing, workshop wash bays and paint equipment cleaning. Wash areas for domestic use shall ensure that the disposal of contaminated “grey” water is sanctioned by the Engineer.

6.4 Hazardous Substances

Hazardous chemical substances (as defined in the Regulations for Hazardous Chemical Substances) used during construction shall be stored in secondary containers. The relevant Material Safety Data Sheets (MSDS) shall be available on Site. Procedures detailed in the MSDS shall be followed in the event of an emergency situation.

If potentially hazardous substances are to be stored on site, the Contractor shall provide a Method Statement detailing the substances/ materials to be used, together with the storage, handling and disposal procedures of the materials.

No paint products and chemical additives and cleaners such as thinners and turpentine, may be disposed of on Site. Brush / roller wash facilities shall be established to the satisfaction of the Engineer. A Method Statement, approved by the Engineer, is required.

6.5 Workshop, Equipment, Maintenance and Storage

Where practical, all maintenance of plants on Site shall be performed in the workshop. If it is necessary to do maintenance outside of the workshop area, the Contractor shall obtain the approval of the Engineer prior to commencing activities.

The Contractor shall ensure that in the workshop and other plant maintenance facilities, including those areas where, after obtaining the Engineer's approval, the Contractor carries out emergency plant maintenance, there is no contamination of the soil or vegetation. The workshop shall have a smooth impermeable floor either constructed of concrete or thick plastic covered with sufficient sand to protect the plastic from damage. The floor shall be bunded and sloped towards an oil trap or sump to contain any spillages of substances (e.g. oil). A Method Statement detailing the design and construction of the workshop must be submitted.

When servicing equipment, drip trays shall be used to collect the waste oil and other lubricants. Drip trays shall also be provided in construction areas for stationary plant (such as compressors) and for "parked" plant (such as scrapers, loaders, vehicles).

All vehicles and equipment shall be kept in good working order and serviced regularly. Leaking equipment shall be repaired immediately or removed from the Site.

The washing of equipment shall be restricted to urgent or preventative maintenance requirements only. All washing shall be undertaken in the workshop or maintenance areas, and these areas must be equipped with a suitable impermeable floor and sump/oil trap. The use of detergents for washing shall be restricted to low phosphate and nitrate containing and low sudsing-type detergents.

6.6 Dust Control

The Contractor shall take all reasonable measures to minimise the generation of dust as a result of construction activities to the satisfaction of the Engineer and ECO. In extreme instances, the use of specific dust suppressant additives such as “Dustex” may be necessary in order to limit dust generation from haul roads.

During high wind conditions, the Contractor shall comply with the Engineers instructions regarding dust suppression measures. The Engineer may request the temporary cessation of all construction activities where wind speeds are unacceptably high, and until such time as wind speeds return to acceptable levels.

6.7 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 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.

Table 6.1 below provides the mitigation measures to be implemented for the potential impacts identified.

Table 6.1 Design and Construction Phase Mitigation Measures for the Proposed Development

Mitigation Measure	Responsibility	Timing / 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.
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		

Mitigation Measure	Responsibility	Timing / Frequency
Preconstruction walk-through of the approved development footprint by a qualified specialist to ensure that sensitive habitats and species are avoided where possible.	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Search and Rescue of species of conservation concern (SCCs) must be conducted prior to clearing activities and must be overseen by a botanist knowledgeable with the vegetation of the area and the rehabilitation of this type of vegetation.	ECO to monitor Site engineer/site manager	During site establishment
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 must 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 must be located within previously transformed areas or areas that have been identified as being of low sensitivity. These areas must be rehabilitated after use.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Ensure that lay-down and other temporary infrastructure is within low- sensitivity areas.	ECO to monitor Site engineer/site manager	Design Phase During site establishment
Minimise the development footprint as far as possible and rehabilitate disturbed areas that are no longer required by the operational phase of the development.	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment and post construction
The exact routing of the roads must be adjusted where necessary to avoid features of higher sensitivity such as rocky outcrops, as informed by the preconstruction walk-through of the facility.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Design Phase Pre-Construction ECO to monitor throughout construction.

Mitigation Measure	Responsibility	Timing / Frequency
Demarcate sensitive areas in close proximity to the development footprint as no-go areas with construction tape or similar and clearly mark as no-go area	Developer / Site Engineer ECO to monitor Site engineer/site manager	Design Phase Pre-Construction ECO to monitor throughout construction.
Alien Plant Invasion Risk		
Wherever excavation is necessary, topsoil must 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.
The recovery of the indigenous grass layer must 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.
An alien plant management plan must be submitted as part of the EMPR to be approved by the DEA and implemented on site.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Regular alien clearing must be conducted using the best-practice methods for the species concerned. The use of herbicides must be avoided as far as possible.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Increased Erosion Risk and Soil Degradation		
Dust suppression and erosion management must 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 must 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

Mitigation Measure	Responsibility	Timing / Frequency
A low cover of vegetation must 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 must be avoided and sensitive drainage areas near to the construction activities must be demarcated as no-go areas.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Implement an effective system of storm water run-off control using bunds and ditches, where it is required - that is at all points of disturbance where water accumulation might occur. The system must effectively collect and safely disseminate any run-off water from all hardened surfaces and it must prevent any potential down slope erosion.	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
If an activity will mechanically disturb the soil below surface in any way, then any available topsoil must first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Direct Faunal Impacts		
All personnel must 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.
Preconstruction walk-through of the facility to identify areas of faunal sensitivity such as occupied burrows	Developer ECO to monitor Site manager	Pre- construction.
Any fauna threatened by the construction activities must be removed to safety by the ECO or appropriately qualified environmental officer.	ECO to monitor Site engineer/site manager	During site establishment Weekly.
All construction vehicles must adhere to a low speed limit to avoid collisions with susceptible species.	ECO to monitor Site engineer/site manager / safety officer	During site establishment. Weekly.
During construction any fauna directly threatened by the construction activities must be removed to a safe location by the ECO or other suitably qualified person.	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment Weekly.
The illegal collection, hunting or harvesting of any plants or animals at the site must be strictly forbidden. Personnel must not be allowed to wander off the construction site.	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment Weekly.

Mitigation Measure	Responsibility	Timing / Frequency
No fires must be allowed on site as the vegetation is vulnerable to runaway fires.	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment Weekly.
No fuelwood collection must be allowed on-site.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Weekly.
No dogs or cats must be allowed on site at the construction camps apart from those of the landowners.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Weekly.
If any parts of site such as construction camps must be lit at night, this must be done with low-UV type lights (such as most LEDs) as far as practically possible, which do not attract insects and which must be directed downwards	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
No unauthorized persons must be allowed onto the site and site access must be strictly controlled.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Weekly.
All construction vehicles must adhere to a low speed limit (40km/h for cars and 30km/h for trucks). Speed limits must apply within the facility as well as on the public gravel access roads to the site.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Weekly.
All hazardous materials must be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site must 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 must not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches which are standing open must 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.
Loss of Rare, Endemic or Protected Species		
All alien plant re-growth, which is currently high within the greater region must be monitored and should it occur, these plants must be eradicated within the project footprints and especially in areas near the proposed crossings.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Monthly.

Mitigation Measure	Responsibility	Timing / Frequency
A final pre-construction walkdown must be conducted, as part of a Plant Search and Rescue plan, with the appropriate permits in place.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction / design phase.
Where any roads and crossings will be upgraded, the following applies: 4. All pipe culverts must be removed and replaced with suitably sized box culverts, where road levels are raised. 5. River levels, regardless of the current state of the river / water course will be reinstated thus preventing any impoundments from being formed. The related designs must be assessed by an aquatic specialist during a post authorisation walkdown, prior to commencement of the construction phase. 6. Approach road embankments especially where large cut and fill areas will be required must be rehabilitated during the construction process, to minimise erosion. Suitable stormwater management systems must be installed and monitored during the first few months of use. Any erosion / sedimentation must be prevented.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction / design phase. During site establishment. Monthly thereafter.
Loss of Functional Habitat within the Site and Near Any of the Required Crossing Upgrades		
All alien plant re-growth must be monitored and should it occur, these plants must be eradicated within the project footprints and especially in areas near the proposed crossings	Developer / Site Engineer ECO to monitor Site engineer/site manager	During site establishment. Monthly thereafter.
All pipe culverts must be removed and replaced with suitably sized box culverts, where road levels are raised.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction / design phase.
River levels, regardless of the current state of the river / water course will be reinstated thus preventing any impoundments from being formed. The related designs must be assessed by an aquatic specialist during a post authorisation walkdown, prior to commencement of the construction phase	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction / design phase. Monthly thereafter.
Approach road embankments especially where large cut and fill areas will be required must be rehabilitated during the construction process, to minimise erosion	Developer / Site Engineer ECO to monitor Site engineer/site manager	Weekly.
Suitable stormwater management systems must be installed and monitored during the first few months of use. Any erosion / sedimentation must be prevented.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Weekly.

Mitigation Measure	Responsibility	Timing / Frequency
Avifaunal Habitat Destruction		
High traffic areas and buildings such as offices, batching plants, storage areas etc. must be situated in areas that are already disturbed, if available.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction / design phase.
Existing roads and farm tracks must be used where possible.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction / design phase.
The minimum footprint area possible of infrastructure must be used, including road widths and lengths.	ECO to monitor Site engineer/site manager	Prior to construction
During construction laydown areas and temporary access roads must 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.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Highly sensitive zones and no-go areas (e.g. nesting areas) must be cordoned off, clearly marked and avoided unless absolutely necessary.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
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 within which construction activities need to be excluded and/or the schedules adjusted.	Developer / Site Engineer 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 must apply good environmental practice during construction.	ECO to monitor Site engineer/site manager	Throughout construction
Turbines must not be constructed within any High Sensitivity Zones	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction
Disruption of Local Bird Movement Patterns		
Turbines must not be constructed within any high sensitivity zones identified through pre-construction monitoring and impact assessment.	Developer / Site Engineer ECO to monitor	Pre-construction

Mitigation Measure	Responsibility	Timing / Frequency
	Site engineer/site manager	
The lowest feasible number of turbines should be constructed for the required MW output. Therefore, fewer larger (i.e with a higher MW output) turbine models should be favoured where possible.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction
Lighting on turbines to be of an intermittent and coloured nature rather than constant white light to reduce the possible impact on the movement patterns of nocturnal migratory species.		
Avifaunal Disturbance and Displacement		
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/roosting activity of sensitive species, as well as any additional sensitive habitats. The results must inform the final construction schedule, including abbreviating construction time, scheduling activities around avian breeding and/or movement schedules, and lowering levels of associated noise.	ECO to monitor Site engineer/site manager	Monthly and when required.
During Construction, if any of the Priority Species or Red Data species identified in this report are observed to be roosting and/or breeding in the vicinity (within 500 m of the power line), the Avifaunal Specialist is to be contacted immediately for further instruction, while a ‘no go’ buffer of 300 m is to be instituted around the nest site until the specialist has given further instructions.	ECO to monitor Site engineer/site manager	Pre-construction, post final design
No nests are to be disturbed or moved.	ECO to monitor Site engineer/site manager	As per specialist requirements.
Sensitive zones and no-go areas are to be designated by the specialist (e.g. nesting sites) and must be clearly marked, cordoned off and avoided unless absolutely necessary.	Developer / Site Engineer ECO to monitor Site engineer/site manager	As per specialist requirements.
Bird collisions		
Attach appropriate marking devices (BFDs) on overhead power lines to increase visibility. The advice of a specialist must be sought regarding the type, placement and spacing of the BFDs to be used.	Developer / Operator to implement. Specialists to be appointed. ECO to Monitor.	Pre-Construction Design Phase.
Any new 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 and possible bird perches (e.g. cross arms) of 1.8 m or greater. Each pylon must be fitted with a safe bird perch.	Developer / Operator to implement. Specialists to be appointed. ECO to Monitor.	Pre-Construction Design Phase.

Mitigation Measure	Responsibility	Timing / Frequency
Lighting on turbines to be of an intermittent and coloured nature rather than constant white light to reduce the possible impact on the movement patterns of nocturnal migratory species.	Developer / Operator to implement. ECO to Monitor.	Pre-Construction Design Phase.
Any new overhead power lines must be of a design that minimizes electrocution risk by using adequately insulated 'bird friendly' structures, with clearances between live components of 1.8 m or greater and which provides a safe bird perch. A replica or 'mock up' of the exact pole structures (including bend point structures), or at least a 3D model simulation that specifically shows how the jumpers will be placed and insulated, must be examined and approved by the bird specialist in consultation with EWT.	Developer / Operator to implement. ECO to Monitor.	Pre-Construction Design Phase.
Bat Roost Disturbance and/or Destruction		
Designing the layout of the project to avoid areas that are more frequently used by bats may reduce the likelihood of mortality and must be the primary mitigation measure. Low lying areas, buildings, woodland/thicket and areas near water must be avoided.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction / design phase.
It is recommended that a bat specialist survey the confirmed turbine locations and all other proposed site infrastructure for the presence of roosts within 200 m before any construction activities commence and once the preliminary design and layout of each WEF is complete.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Pre-construction / design phase.
It is recommended that a bat specialist surveys the confirmed turbine locations and the locations of all other site infrastructure, such as pylons, for the presence of occupied roosts among the potential roosts before any construction activities commence and once the preliminary design and layout of the site is complete.	Developer to appoint ECO to monitor Site engineer/site manager	Pre-construction / design phase.
If occupied roosts are confirmed these must be buffered based on best practise guidance, which includes a minimum buffer of 200 m.	Developer ECO	Pre-construction / 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.
Dust suppression measures to be used during the full construction phase.	ECO to monitor Site engineer/site manager	Weekly
Any new roosts discovered, must be reported and incorporated into the adaptive management plan.	ECO to monitor Site engineer/site manager	Monthly and as required during construction
Bat Habitat Modification		

Mitigation Measure	Responsibility	Timing / Frequency
Clearing of natural and agricultural areas be kept to a minimum	ECO to monitor Site engineer/site manager	Pre-construction / design phase. Monthly thereafter.
Before construction commences, a bat specialist must conduct a site walkthrough, covering the final road and power line routes as well as the final turbine positions.	Developer to appoint ECO to monitor Site engineer/site manager	Pre-construction / design phase.
During construction laydown areas and temporary access roads must 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	ECO to monitor Site engineer/site manager	Pre-construction / design phase.
Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and a habitat restoration plan must be developed by a specialist	ECO to monitor Site engineer/site manager	Post construction. Weekly.
Loss of Riparian Systems and Disturbance of the Alluvial Watercourses		
Where new 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 (reduce footprint as much as possible).	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
No vehicles to refuel within drainage lines/ riparian vegetation.	ECO to monitor Site engineer/site manager	Weekly
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.
Vegetation clearing should occur in in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
It is also advised that an Environmental Control Officer (ECO), with a good understanding of the local flora be appointed during the construction phase. The ECO should be able to make clear recommendations with regards to the re-vegetation of the newly completed / disturbed areas within aquatic environment, using selected species detailed in this report	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.

Mitigation Measure	Responsibility	Timing / Frequency
All alien plant re-growth must be monitored, and should it occur these plants should be eradicated. The scale of the operation does however not warrant the use of a Landscape Architect and / or Landscape Contractor.	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.
Vegetation clearing should occur in in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment		
No stormwater runoff must be allowed to discharge directly into any water course along roads, and flows should thus be allowed to dissipate over a broad area covered by natural vegetation		
Stormwater from hard stand areas, buildings and substation must be managed using appropriate channels and swales when located within steep areas or have steep embankments.		
Increase in Sedimentation and Erosion within the Development Footprint		
Any storm-water within the site must be handled in a suitable manner, i.e. trap sediments and reduce flow velocities. Any management actions must be dealt with in the Stormwater Management Plan (SWMP) typically submitted post EA, forming part of any WULA.	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 in line with the specific material safety data sheets, e.g. fuels must be stored within a contained / bunded site with the necessary and spill kits available.	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

Mitigation Measure	Responsibility	Timing / Frequency
Working protocols incorporating pollution control measures (including approved method statements by the contractor) must 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 must be provided for construction workers during construction and on-site staff during the operation of the facility (generally accepted 1:14 separate male and female facilities).	ECO to monitor Site engineer/site manager	Weekly
Potential Visual Effect of Construction Activities, including Cranes, Construction Traffic, Dust and Noise Affecting the Rural Sense of Place		
Carefully plan to mimimise the construction period and avoid construction delays	Site engineer/site manager	Design phase
Inform receptors of the construction programme and schedules	ECO to monitor Site engineer/site manager	Design phase
Minimise vegetation clearing and rehabilitate cleared areas as soon as possible.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Vegetation clearing should take place in a phased manner.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Maintain a neat construction site by removing rubble and waste materials regularly.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Make use of existing gravel access roads where possible	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Limit the number of vehicles and trucks travelling to and from the proposed site, where possible	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
Unless there are water shortages, ensure that dust suppression techniques are implemented – on all access roads; – in all areas where vegetation clearing has taken place; – on all soil stockpiles.	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

Mitigation Measure	Responsibility	Timing / Frequency
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.
Damage or Destruction of Archaeological Resources During Clearing of the Ground or Excavation of Foundations		
A final walk-down survey of the authorised footprint must be carried out at least 6 months before the start of construction in order for any archaeological mitigation requirements to be determined and carried out.	ECO to monitor Site engineer/site manager	During site establishment Monthly thereafter.
During the construction phase a chance-finds procedure must 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, so that appropriate action can be taken by a professional palaeontologist	When required during construction
If any archaeological material or human burials are uncovered during the course of development then work in the immediate area must be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.	Developer / Site Engineer ECO to monitor Site engineer/site manager	Throughout construction. Weekly checks.
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	ECO to monitor Site engineer/site manager	Throughout construction.

Mitigation Measure	Responsibility	Timing / Frequency
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.		
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.
A minimum 30 m buffer to be maintained around all graves, ruins and buildings	ECO to monitor Site engineer/site manager	Pre-construction and throughout construction
Creation of Local Employment, Training, and Business Opportunities		
The project proponent of Paulputs WEF should liaise with the Khâi-Ma and Kai !Garib Local Municipalities to establish a local skills database for the associated areas. The existence of such a skills database should be made available to the contractors before the commencement of the construction phase to establish the extent of the available service providers in the local municipalities	Developer/ site manager	Pre-construction and throughout construction
The key stakeholders, local authorities and the community need to be informed regarding the outcome of the decision of the Paulputs WEF. The potential employment opportunities and the employment procedure that the project proponent intends to follow should be clearly communicated before the commencement of the construction phase	Developer/ site manager	Pre-construction and throughout construction
Reasonable and practical efforts should be made by the project proponent to appoint local contractors by implementing a “locals first” policy. However, due to the technical nature of this project it is likely that skilled positions will be filled by people from outside the local areas	Developer/ site manager	Pre-construction and throughout construction
Where feasible a training and skills development programmes for local workers must be initiated prior to the initiation of the construction phase	Developer/ site manager	Pre-construction and throughout construction
Efforts should be made to employ local contractors first, and also contractors that are compliant with the Broad Based Black Economic Empowerment (BBBEE) criteria.	Developer/ site manager	Pre-construction and throughout construction
The recruitment selection process should also seek to promote gender equality.	Developer/ site manager	Pre-construction and throughout construction
If feasible training and skills development programmes for the local workers should be initiated prior to the initiation of the construction phase of the Paulputs WEF.	Developer/ site manager	Pre-construction and throughout construction
Impacts of Construction Workers on Local Community and Influx of Job Seekers		

Mitigation Measure	Responsibility	Timing / Frequency
The project proponent should implement a "locals first" policy, where the local community of Pofadder and Kakamas should be employed first, specifically for un-skilled and low-skilled employment opportunities.	Developer/ site manager	Pre-construction and throughout construction
The project proponent should implement a policy that no employment opportunities will be available at the gate.	Developer/ site manager	Pre-construction and throughout construction
The proposed construction site for the Paulputs WEF should be clearly fenced off for potential security risks in this regard.	Developer/ site manager	Pre-construction and throughout construction
It should be noted that although the significance of this impact is low, the influx of job seekers can not be avoided or prevented.	Developer/ site manager	Pre-construction and throughout construction
The project proponent and appointed contractors need to develop a code of conduct which must be signed by construction workers prior to the construction phase. The code of conduct should clearly outline the acceptable behaviour and activities of construction workers. In doing so construction workers will be legally informed and held liable for any damages or losses. It is however important that dismissals or fines must comply with the South African labour legislation.	Developer/ site manager	Pre-construction and throughout construction
The proposed site for the Paulputs WEF should be clearly demarcated and fenced off to effectively monitor the movement of construction workers in the vicinity of the project site.	Developer/ site manager	Pre-construction and throughout construction
Transportation for the construction workers need to be arranged by the project proponent on a daily basis, and enable the proponent to effectively monitor the movement of construction workers to and from the project site. Where necessary arrangements need to be made by the project proponents to enable construction workers to return to their hometowns over weekends/on a regular basis to reduce the potential risks posed to local family structures and social networks.	Developer/ site manager	Pre-construction and throughout construction
No staff should be accommodated over-night on the construction site, except for the presence of security staff throughout the night on site due to security reasons for the landowners and their workers.	Developer/ site manager	Pre-construction and throughout construction
HIV/AIDS awareness programmes should be implement by the project proponent for the construction workers during the construction phase.	Developer/ site manager	Pre-construction and throughout construction
Maximising of opportunities to local and regional SMMEs and other businesses for service delivery.		
The project proponent of Paulputs WEF should liaise with the Khâi-Ma and Kai !Garib Local Municipalities to establish a database for the local companies/service providers of the associated areas. This database should be made available to the contractors before the initiation of the construction phase to notify and invite such service providers to tender for project-based services. However, it should be noted that a competitive tender process may not guarantee the employment of	Developer/ site manager	Pre-construction and throughout construction

Mitigation Measure	Responsibility	Timing / Frequency
local service providers/companies and this should also be clearly communicated to potential contractors.		
Efforts should be made by the project proponent to assist local Broad Based Black Economic Empowerment (BBBEE) companies regarding the application and submission of tenders.	Developer/ site manager	Pre-construction and throughout construction
Strategies need to be identified by the local municipalities and the local business sectors, in order to maximise the potential benefits which can be associated with the establishment of the Paulputs WEF	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 proposed construction site for the Paulputs WEF should be clearly fenced off and the movement of construction workers should be limited to the vicinity of the construction site	Developer/ site manager	Pre-construction and throughout construction
The project proponent/ appointed contractors should provide transportation to the construction workers on a daily basis. This will ensure the potential risk regarding the trespassing of construction workers on farmers' properties, be reduced.	Developer/ site manager	Pre-construction and throughout construction
The project proponent and appointed contractors need to develop a code of conduct which must be signed by construction workers prior to the construction phase. The code of conduct should clearly outline the acceptable behaviour and activities of construction workers. In doing so construction workers will be legally informed and held liable for any damages/theft. Construction workers found guilty of such an offence should be charged and dismissed. It is however important that dismissals or fines must comply with the South African labour legislation.	Developer/ site manager	Pre-construction and throughout construction
The project proponent should enter into an agreement with the farmers prior to the construction phase, whereby the damages/losses to farming property/infrastructure be compensated for, if it can be proven to be associated with the construction activities of the proposed WEF.	Developer/ site manager ECO to monitor	Pre-construction and throughout construction
The project proponent should hold the appointed contractors liable for the compensation to farmers for any damages or losses that can be associated with the construction phase of the proposed project. This should also be included in the Code of Conduct signed by all key stakeholders.	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 must 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
Procedures regarding waste management on the construction site should be clearly outlined in the Environmental Management Programme (EMPr), to reduce the risk it poses to livestock.	Developer/ site manager Safety officer	Pre-construction and throughout construction

Mitigation Measure	Responsibility	Timing / Frequency
Potential Loss Of Livestock, Crops And Houses, Damage To Farm Infrastructure And Threat To Human Life Associated With Increased Incidence Of Grass Fires		
Firebreaks must be implemented by the contractor around the perimeters of the construction site.	Developer/ site manager	Pre-construction and throughout construction
The project proponent should enter into an agreement with the farmers prior to the construction phase, whereby the damages/losses to farming property/infrastructure due to fire risks be compensated for, if it can be proven to be associated with the construction activities of the proposed WEF.	Site engineer/ site manager Safety officer	Pre-construction and throughout construction
In the event of a fire due to construction related activities, the contractor must repair any damages caused to the farmers. The farmers need to be compensated for any damages caused due to fires borne during construction related activities. The costs with regards to firefighting should also be borne by the contractor.	Developer/ site manager ECO to monitor	Daily. Pre-construction and throughout construction
The necessary precautionary measures need to be taken during high wind conditions and dry months	Site engineer/ site manager Safety officer	Pre-construction and throughout construction
The appointed contractors should ensure that any construction related activities that might pose potential fire risks, for example welding and grinding, are confined to the designated areas and that it is properly managed.	Site engineer/ site manager Safety officer	Pre-construction and throughout construction
Adequate fire-fighting equipment should be provided by the contractors and should be readily available and serviced on a regular basis. Additionally, all staff should be training in fire-fighting and how to use the related fire-fighting equipment.	Site engineer/ site manager Safety officer	Pre-construction and throughout construction
The appointed contractor should ensure that no open fires for the use of cooking or heating should be allowed, except for designated areas.	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 inform local farmers and representatives from the local and district municipality, of dates and times when abnormal loads will be undertaken.	Site engineer/ site manager Safety officer and ECO	Pre-construction and throughout construction
The contractor and developer must liaise with nearby solar farms to minimise potential impacts (e.g. minimise dust generation near existing solar farms and prevent damage to roads or other existing infrastructure).	Developer / Site engineer/ site manager Safety officer and ECO	Pre-construction and throughout construction

Mitigation Measure	Responsibility	Timing / Frequency
The contractor must ensure that damage caused by construction related traffic to the gravel public roads and local, internal farm roads is repaired on a regular basis throughout the construction phase. The costs associated with the repair must be borne by the contractor.	Developer/ site manager ECO to monitor	Daily. Pre-construction and throughout construction
Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis[3], adhering to speed limits and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.	Developer/ site manager ECO to monitor	Daily. Pre-construction and throughout construction
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 must 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 must 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 must be fined.	Site engineer/ site manager Safety officer and ECO	Daily. Pre-construction and throughout construction
The Contractor must 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 must be transported to the registered landfill.	Site engineer/ site manager ECO	Weekly throughput construction
EMPR measures (and penalties) must 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
EMPR measures (and penalties) must 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
As far as possible, the transport of components to the site along the national road must be planned to avoid weekends and holiday periods	Developer/ site manager ECO to monitor	Daily. Pre-construction and throughout construction

[3] Treated effluent (non-potable) water must be used for wetting of roads and construction areas

Mitigation Measure	Responsibility	Timing / Frequency
The loss of farmlands for grazing of sheep and on associated farming activities		
The location of wind turbines, access roads, laydown areas etc. must be informed by the findings of key specialist studies, including the soil and botanical study. In this regard areas of high potential agricultural soils must be avoided;	Site engineer/ site manager Developer to implement ECO	Weekly. Pre-construction and throughout construction
In addition, the project proponent should consult with the affected land owners for their inputs and comments on the finalization of the layout of the wind turbines and associated infrastructure, in order for landowners to factor in the construction activities and the impact thereof on their farmlands and farming activities	Site engineer/ site manager Developer to implement ECO	Weekly. Pre-construction and throughout construction
The proposed site for the Paulputs WEF should be clearly demarcated and fenced-off prior to the construction phase. All construction related activities must be confined to this area	Site engineer/ site manager Developer to implement ECO	Weekly post construction
The implementation of a rehabilitation programme must be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme must be drawn up the Environmental Consultants appointed to undertake the EIA;	Site engineer/ site manager Developer to implement ECO	Tender phase
The footprint of the impact associated with the construction phase need to be kept to the minimum, and sheep need to be relocated to alternative farmlands for the period of the construction phase.	Site engineer/ site manager Developer to implement ECO	Weekly
It is advised that the construction phase take place in two phases and also to start with construction from one part of the site and gradually work the construction thereof through to the other part of the site to ensure that the disturbance to the landowners and their farming activities are kept to the minimum.	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Monthly
All impacted areas disturbed during the construction phase must be rehabilitated at the end of the construction phase. Rehabilitation plans need to be informed by the soil and agricultural specialist studies.	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Daily
An Environmental Control Officer (ECO) must be appointed to continuously monitor the activities associated with the construction phase. The ECO should also apply social monitoring on a quarterly basis and monitor the implementation of the Rehabilitation Programme.	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Monthly

Mitigation Measure	Responsibility	Timing / Frequency
A Rehabilitation Programme should be implemented by the project proponents. The specifications hereof should be compiled by the appointed EIA practitioners and must be included in the project proponents terms of reference and also be included in the EMPr.	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Monthly
In the case where a farmer experience permanent loss of farmland due to the construction of the proposed Paulputs WEF, the project proponents should compensate the farmer for the loss of the farmland as in the nature of the agreement made to the affected landowners.	Site engineer/ site manager Developer to implement ECO	Pre-construction and throughout construction. Monthly
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 must 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	Timing / 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 must 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 must 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 condoms. The distribution of condoms must be approached with the necessary cultural sensitivity.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks

Mitigation Measure	Responsibility	Timing / Frequency
Access at the construction site must 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 must 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 activities should be limited to times agreed with the local municipalities	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
Deliveries of turbine components, plant and materials by HGV to site should only take place by designated routes and within times agreed with the relevant authorities	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Daily

Mitigation Measure	Responsibility	Timing / Frequency
The site contractors should employ the best practicable means of reducing noise emissions from plant, machinery and construction activities, as described in BS 5228	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 must be limited, blasting must be undertaken at the same times each day and no blasting must 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 must liaise with local residents on how best to minimise impact, and the local population must 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 practicable, the work programme should be phased, which would help to reduce the combined effects arising from construction operations	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Daily
Where practicable, noise from fixed plant and equipment should be contained within suitable acoustic enclosures or behind acoustic screens	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. monthly checks
Construction activities must 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. Daily
Any plant and equipment normally required for operation at night (19:00 - 07:00), e.g., generators, should be suitably screened or located such that noise levels from the plant do not exceed 45 dB, LAeq at the nearest noise-sensitive receptors.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Monthly checks.
Traffic Congestion, Impedance to Traffic Flow due to Increase in Traffic Volumes		

Mitigation Measure	Responsibility	Timing / Frequency
Transport Management Plan to be produced to include: • Ensure safe transport of materials, equipment, etc. to site; • Optimise route selection and time of travel; • Co-ordinate traffic law-enforcement and transport to site; • Design on-site roads to facilitate access to laydown areas, substations and wind turbines; • Conduct a dry-run prior to implementation of the Transport Management Plan.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Design Phase / Pre-construction
Minor Road Degradation due to Increased Traffic		
Document condition of gravel roads prior to construction.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Monthly checks.
Upgrade gravel roads to suitable condition for proposed construction vehicles.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Monthly checks.
Ensure that the minor road is left in a better condition post-construction.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Monthly checks.
Intersection Road Safety		
Place warning construction vehicle signage on the N14 and MN759.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Monthly checks.
Ensure that all construction vehicles are roadworthy.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Monthly checks.
Ensure that all construction vehicles have appropriate drivers licence.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Pre-construction and throughout construction. Monthly checks.

6.8 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 must 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.

6.8.1 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

6.8.2 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.

6.8.3 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 and Grid Connection is completed the project becomes operational. The operator of the WEF and the Gird Connection has the responsibility to ensure that the mitigation measures proposed for the operational phase is implemented and conducted appropriately.

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).

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.

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 Mitigation Measures

Table 7.1 presents the mitigation measure to be implemented for the potential impacts identified.

Table 7.1 Operational Phase Mitigation Measures

Mitigation Measure	Responsibility	Timing / Frequency
Ecology		
Compile Quiver Tree Monitoring Programme and submit to DENC for review. Following DENC approval implement the Quiver Tree Monitoring Programme.	Developer / Operator ECO	Throughout operation. Monthly checks
Management of the site must take place within the context of an Open Space Management Plan. A draft Open Space Management Plan is included in this EMPR and must be updated once the final site development plan is finalised and submitted to the DEA for approval.	Developer / Operator ECO	Throughout operation. Monthly checks
Erosion management at the site must take place according to the Erosion Management Plan and Rehabilitation Plan. A draft Erosion Management Plan and Rehabilitation Plan is included in this EMPR and must be updated once the final site development plan is finalised and submitted to the DEA for approval.	Developer / Operator ECO	Throughout operation. Monthly checks
Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance, as per the Erosion Management and Rehabilitation Plans for the project.	Developer / Operator ECO	Throughout operation. Monthly checks
Update and implement the Invasive Alien Plant Management Plan.	Developer / Operator ECO	Throughout operation. Monthly checks
Wherever excavation is necessary, topsoil must be set aside and replaced after construction to encourage natural regeneration of the local indigenous species. The recovery of the indigenous shrub/grass layer must 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 must be conducted using the best-practice methods for the species concerned. The use of herbicides must 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 must 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 must 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	Timing / Frequency
All cleared areas must 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 must be allowed onto the site. Any potentially dangerous fauna such snakes or fauna threatened by the maintenance and operational activities must be removed to a safe location. The collection, hunting or harvesting of any plants or animals at the site must be strictly forbidden. If the site must be lit at night for security purposes, this must be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects. All hazardous materials must 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 must adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species. If parts of the facility are to be fenced, then no electrified strands must be placed within 30cm of the ground as some species 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 must 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		
Develop and implement a carcass search programme for birds during the first two years of operation, in line with the applicable (i.e. at the start of operations at the wind farm) South African monitoring guidelines.	Developer to implement. Specialists to be appointed.	Operational Phase. Monthly checks.
The on-site WEF manager (or a suitably appointed Environmental Manager) must be trained by an 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 an avifaunal specialist must be contacted for further instruction	Developer / Operator to implement. Specialists to be appointed. ECO to Monitor.	Operational Phase. Monthly checks.
Develop and implement a 24 month post-construction bird activity monitoring program that mirrors the pre-construction monitoring surveys completed by Arcus and is in line with the applicable South African post-construction monitoring guidelines. This program must include thorough and ongoing nest searches and nest monitoring.	Developer / Operator to implement. Specialists to be appointed. ECO to Monitor.	Operational Phase. Monthly checks.

<table>
<tr><th>Mitigation Measure</th><th>Responsibility</th><th>Timing / Frequency</th></tr>
<tr><td>Frequent and regular review of operational phase monitoring data (activity and carcass) and results by an avifaunal specialist. This review should also establish the requirement for continued monitoring studies (activity and carcass) throughout the operational and decommissioning phases of the development.</td><td>Developer / Operator to implement.
Specialists to be appointed.
ECO to Monitor.</td><td>Throughout operation. Monthly checks.</td></tr>
<tr><td>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 and independent review), the specialist should conduct a literature review specific to the impact (e.g. collision and/or electrocution) and provide updated and relevant mitigation options to be implemented. As a starting point for the review of possible mitigations, the following may need to be considered:
– 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 (e.g. temporary curtailment or shutdown on demand) to reduce collision risk if absolutely necessary and other methods have not had the desired results.</td><td>Site engineer/ site manager
Developer to implement
ECO and Safety Officer</td><td>Throughout operation. monthly checks</td></tr>
<tr><td>BFDs must be maintained and replaced where necessary, for the life span of the project and any collision incidents be reported to the Endangered Wildlife Trust (EWT). Prior to construction, an avifaunal specialist must be consulted to provide recommendations regarding the most appropriate (and latest available technology) device to be used. The specialist should also conduct a pre-construction walk-though of the final approved power line routes, once the pylon positions have been pegged, to determine which (if any) spans may require specialised marking with nocturnal solar powered LED devices</td><td>Site engineer/ site manager
Developer to implement
ECO and Safety Officer</td><td>Throughout operation. monthly checks</td></tr>
<tr><td>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 any overhead power lines, including the new grid connection line</td><td>Site engineer/ site manager
Developer to implement
ECO and Safety Officer</td><td>Throughout operation. monthly checks</td></tr>
<tr><td colspan="3">Bats</td></tr>
<tr><td>Operational acoustic monitoring and carcass searches for bats must be performed, based on best practice, to monitor mortality and bat activity levels. Acoustic monitoring should include monitoring at height (from more than one location i.e. such as on turbines) and at ground level.</td><td>Site engineer/ site manager
Developer to implement
ECO and Safety Officer</td><td>Throughout operation. monthly checks</td></tr>
</table>

Mitigation Measure	Responsibility	Timing / Frequency
If mortality does occur beyond threshold levels as determined based on applicable guidance (MacEwan et al. 2018), mitigation needs to be considered. Mitigation options may include using ultrasonic deterrents, raising the cut-in speeds of turbines and turbine blade feathering. Any operational minimization strategy (i.e. curtailment) should be targeted during specific seasons and time periods for specific turbines coincident with periods of increased bat activity.	Site engineer/ site manager Developer to implement ECO and Safety Officer	Throughout operation. monthly checks
Apply curtailment during February, August and October based on Bat Curtailment Plan if mortality does occur beyond threshold levels as determined based on applicable guidelines.	Developer / Operator to implement. Specialists to be appointed. ECO to Monitor.	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 must 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.
As new information becomes available with regard to successful mitigation strategies tested, this information must feed into the adaptive management plan.	Site engineer/ site manager Developer to implement ECO	Throughout operation. monthly checks
At operational wind energy facilities where impacts to bats are high, or exceed threshold[4] values, mitigation strategies such as curtailment or deterrents must be used	Site engineer/ site manager Developer to implement ECO	Throughout operation. monthly checks
Social		
Skills development programmes and training should be provided and implemented to maximise the number of employment opportunities for the local communities of Pofadder and Kakamas.	Developer to implement	Throughout operation. Monthly checks
The project proponent together with the Khâi-Ma and Kai !Garib Local Municipalities should explore the option for establishing a Community Development Trust.	Developer to implement	Throughout operation. Monthly checks

[4] MacEwan, K., Aronson, J., Richardson, E., Taylor, P., Coverdale, B., Jacobs, D., Leeuwner, L., Marais, W., Richards, L. 2018. South African Bat Fatality Threshold Guidelines for Operational Wind Energy Facilities – ed 2. South African Bat Assessment Association.

Mitigation Measure	Responsibility	Timing / Frequency
The project proponent and the local municipalities, together with the Tourism Centre, need to explore the possibility of establishing a visitor centre for the proposed project.	Developer to implement	Post Construction.
The potential opportunities for local content, procurement as well as community shareholding should be explored and maximised.	Developer to implement	Throughout operation. Monthly checks
The potential trustees to sit on a Community Trust need to be identified with the assistance of the Khâi-Ma and Kai !Garib local municipalities. The structure of this trust and the trustees also need to be established to ensure that the Trust is also not mismanaged.	Developer to implement	Throughout operation. Monthly checks
There must be strict financial management controls in place to manage the funds generated for a Community Trust for the proposed Paulputs WEF. Financial management controls that could be implemented can include annual audits.	Developer to implement	Throughout operation. Monthly checks
There should be a clear criteria for the identification and the funding of community projects, for the local communities to optimally benefit from the trust.	Developer to implement	Throughout operation. Monthly checks
Noise		
The maximum operational noise level from the Development should not exceed 45dB, L_{Aeq} at the closest identified potential noise-sensitive development.	Site engineer/ site manager Developer to implement ECO	Throughout operation. monthly checks
Operational noise monitoring to be undertaken at the closest residential dwelling (H3), within 6 months of the Development being fully commissioned. In the event that the Development is found to exceed the noise limit specified above, the operator should implement a noise abatement programme in consultation with a suitably qualified Acoustics Consultant, and a further measurement undertaken to determine compliance. This cycle should continue until it can be demonstrated that the Development is operating within its specified noise limit.	Developer to implement	Throughout operation. Monthly checks
Visual		
Where possible, fewer but larger turbines with a greater output should be utilised rather than a larger number of smaller turbines with a lower capacity.	Developer to implement	Pre-Construction / Design Phase
If possible, turbines should be painted plain white, as this is a less industrial colour. Bright colours and logos on the turbines should be kept to a minimum. Where one or more turbine blades are painted in an alternative colour, it is recommended that this colour is restricted to black or grey.	Developer to implement	Pre-Construction / Design Phase

Mitigation Measure	Responsibility	Timing / Frequency
Inoperative turbines should be repaired promptly, as they are considered more visually appealing when the blades are rotating (or at work) (Vissering, 2011).	Developer to implement	Throughout operation
If turbines need to be replaced for any reason, they should be replaced with the same model, or one of equal height and scale. Repeating elements of the same height, scale and form can result in unity and lessen the visual impact that would typically be experienced in a chaotic landscapes made up of diverse colours, textures and patterns (Vissering, 2011).	Developer to implement	Throughout operation
Unless there are water shortages, dust suppression techniques are to be implemented on all access roads.	Developer to implement	Throughout operation
Light fittings for security at night should reflect the light toward the ground and prevent light spill.	Developer to implement	Throughout operation
The operation and maintenance buildings should not be illuminated at night.	Developer to implement	Throughout operation
Where possible, underground cabling should be utilised.	Developer to implement	Pre-Construction / Design Phase
Where possible, the operation and maintenance buildings should be consolidated to reduce visual clutter.	Developer to implement	Pre-Construction / Design Phase
The operation and maintenance buildings should be painted with natural tones that fit with the surrounding environment. Non-reflective surfaces should be utilised where possible	Developer to implement	Pre-Construction / Design Phase
Inoperative turbines should be repaired promptly, as they are considered more visually appealing when the blades are rotating (or at work) (Vissering, 2011).	Developer to implement	Throughout operation
If turbines need to be replaced for any reason, they should be replaced with the same model, or one of equal height and scale, where possible. Repeating elements of the same height, scale and form can result in unity and lessen the visual impact that would typically be experienced in a chaotic landscapes made up of diverse colours, textures and patterns (Vissering, 2011)	Developer to implement	Throughout operation
As far as possible, limit the number of maintenance vehicles, which are allowed to access the sites.	Developer to implement	Throughout operation
Aquatic		
Monitor and improve the stormwater and energy dissipation features to minimise impacts on the hydrological regime from alteration of surface run-off patterns.	Developer / Operator to implement	Throughout operation

Mitigation Measure	Responsibility	Timing / Frequency
Strict use and management of all hazardous materials used on site in line with the specific material safety data sheets, e.g. fuels must be stored within a contained / bunded site with the necessary and spill kits available.	Developer / Operator to implement	Throughout operation
Containment of all contaminated water by means of careful run-off management on the development site	Developer / Operator to implement	Throughout operation
Appropriate ablution facilities should be provided for on-site staff during the operation of the facility	Developer / Operator to implement	Throughout operation
Any storm-water within the site must be handled in a suitable manner, i.e. trap sediments and reduce flow velocities. Any management actions must be dealt with in the Stormwater Management Plan (SWMP) typically submitted post EA, forming part of any WULA.	Developer / Operator to implement	Throughout operation
Stormwater from hard stand areas, buildings and substation must be managed using appropriate channels and swales when located within steep areas or have steep embankments	Developer / Operator to implement	Throughout operation
No stormwater runoff must be allowed to discharge directly into any water course along roads, and flows should thus be allowed to dissipate over a broad area covered by natural vegetation.	Developer / Operator to implement	Throughout operation
Any storm-water within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities	Developer / Operator to implement	Throughout operation
All alien plant re-growth must be monitored, and should it occur these plants should be eradicated. The scale of the operation does however not warrant the use of a Landscape Architect and / or Landscape Contractor.	Developer / Operator to implement	Throughout operation

8 ALIEN INVASIVE MANAGEMENT PLAN

8.1 Purpose of the Alien Invasive Management Plan

The purpose of the 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 Paulputs 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 must be minimized and these areas must 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 must include a clearing plan which includes follow up actions for rehabilitation of the cleared area. Alien problems at the site must be identified during pre-construction surveys of the development footprint. This may occur simultaneously to other required reaches and surveys. The clearing plan must then form part of the pre-construction reporting requirements for the site.
- The plan must include a map showing the alien density & indicating dominant alien species in each area.
- Lighter infested areas must be cleared first to prevent the build-up of seed banks.
- Pre-existing dense mature stands ideally must 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 must 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 must be taken that the clearing methods used do not encourage further invasion. As such, regardless of the methods used, disturbance to the soil must be kept to a minimum. Fire is not a natural phenomenon in the area and fire must not be used for alien control or vegetation management at the site.
- The best-practice clearing method for each species identified must 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 must 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 must 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 must be selected that will have the least effect on non-target vegetation.
- Coarse droplet nozzles must be fitted to avoid drift onto neighbouring vegetation.
- The appropriate health and safety procedures must also be followed regarding the storage, handling and disposal of herbicides.

For all herbicide applications, the following guidelines must 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 must 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 must 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 must not be used.	Weekly
Although organic matter is frequently used to encourage regrowth of vegetation on cleared areas, no foreign material for this purpose must be brought onto site. Brush from cleared areas must 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 building sand or dirty earth-moving equipment.) Stockpiles must be checked regularly and any weeds emerging from material stockpiles must be removed.	Weekly
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 must 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 must 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 must 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 must be conducted regularly. Every 6 months for the first two years after construction and annually thereafter. All aliens identified must 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 must take place where the natural vegetation is slow to recover or where repeated invasion has taken place following disturbance.	Biannually, but revegetation must 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, must 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 must be cultivated on-site. If vegetation is required for esthetic purposes, then non-invasive, water-wise locally-occurring species must be used.	When necessary

9.2.1 Monitoring Actions - Operational Phase

The following monitoring actions must 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 must 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 reusing 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 must 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 EMPRs 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 EMPR-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 must 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 must 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 must 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 must 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 plan.
- 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 must preferably be with a cover of vegetation. A dense initial grass or other perennial cover will be desirable. The appropriate seed mix must 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 must be re-introduced, seed must 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 must 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 must 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) must 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 must 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) must 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 must 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 must be 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 must 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 must be strictly controlled
- All visitors and contractors must be required to sign-in
- Signage at the entrance must indicate that disturbance to fauna and flora is strictly prohibited.

The following activities must 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 must be adhered to:

- A grazing management plan for the site must be developed in cooperation with Agricultural Extension services.
- The stocking rate applied must be within the recommended limits as identified by the Department of Agriculture.
- Livestock must 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 must 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 (crashes and traffic congestion) during the construction phase, operations and maintenance phase and decommissioning phase of the proposed WEF. Traffic volumes will increase during the construction phase. Operations, maintenance and decommissioning phase traffic is expected to be insignificant, except where a major WEF component (i.e. replace damaged turbine blade) could be required.

The Traffic Management Plan should include the following:

13.1 Transport of Equipment and Materials

- A comprehensive assessment of the entire route is recommended on award of the project. (The recommended access route is from Saldanha Port towards the N7 near Clanwilliam, and then along the N7 to Springbok where the route follows the N14 through Pofadder to the site)
- Prohibit WEF equipment and materials transportation at night, during the school December holiday period, on public holidays, during festivals or other special events
- Avoid Abnormal Load vehicle transportation in the towns of Saldanha and Springbok during peak traffic hours, as far as possible

13.2 Site Access

- It is proposed to take direct access from the N14 via existing farm accesses. The access design must be submitted to SANRAL for approval
- The construction access points must be stop controlled and widened to allow for exclusive right-turn and left-turn lanes off the N14, which must accommodate the abnormal vehicle turning circles
- Clear and visible signage must be placed on the N14 and around site, clearly demarcating site entry and exit points
- Flagmen, speed reduction and stop control on the N14 will be required to accommodate (super-load) abnormal load vehicles entering and leaving the site (in addition to vehicle escort of super-load vehicles)
- Ensure that access is controlled and that access control staff are trained to avoid tailbacks / delay for vehicles entering the site

13.3 Staff and Worker Transport

- Limit use of private cars by arranging bus transport service for workers
- Provision must be made on-site on either side of the N14, for public transport/bus parking
- Where necessary public transport vehicles should allow boarding and alighting, on-site, on both sides of the N14, to prevent staff/workers crossing the N14 to access public transport
- Provide staff private vehicle parking on-site, on both sides of the N14
- By design, limit pedestrian/vehicle conflict on-site (i.e. vehicle travelled path and pedestrian walkways)

13.4 Abnormal Load Clearance/Permits

- Clearances will be required for the transport of the Wind Turbine components
- Applications for Abnormal Load Permits must be submitted to the Department of Transport and Public Works, Eskom and Telkom for approval
- A WEF Site-specific traffic plan must be developed and implemented during the detailed design phase prior to construction

13.5 Vehicle and Driver Standards

- Monitor for overloading of vehicles
- All vehicles must be roadworthy and serviced regularly

- Use only well trained, suitably qualified and experienced drivers in possession of an appropriate and valid driver's license
- Require all drivers to abide by standard road and safety procedures on-site
- Require all drivers to adhere to the speed limits and rules of the road when travelling on public roads

13.6 Site Management

- Avoid overlapping active work zones (i.e. WEF and GRID construction)
- 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 on site. Monitoring actions to be conducted by the Environmental Control Officer (ECO)
- Maintain incidents / complaints register for community complaints
- Monitor dust generation and implementation of management actions detailed above

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, using the guidelines above;
- 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 MANAGEMENT PLAN

The National Road Traffic Act (NRTA) 93 of 1996 and associated regulations prescribe the permissible vehicle dimensions and masses of vehicles travelling on public roads. Where vehicles will exceed these requirements and where the load cannot be dismantled without significant cost / effort, it must be classified as an abnormal load and an exemption must be obtained in terms of section 81 of the NRTA.

Due to the nature and scale of the proposed development, a Transportation Plan is required to effectively manage the transport of the various Wind Turbine Components (abnormal load) on the public road network.

The Transportation Plan aims to ensure the safe transportation of all components required for the construction of the proposed WEF from point of origin to the construction site. This includes the turbines, substation transformers, electrical cables and pylon structures.

14.1 WEF Components

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

The 90 m long blades are the longest component 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 or in pairs, depending on manufacturers transport requirements.

The various Wind Turbine components are considered to be abnormal loads, either by length, weight or height, usually comprising of 3 tower sections, 1 hub, 1 nacelle and 3 blades. These require different truck / trailer combinations and configurations to be transported.

14.2 Abnormal Load Classification and Permit

During the WEF construction phase, the project will require the use of abnormal load vehicles as stipulated in the TRH 11, for the transportation of turbine components to site. Consequently, an exemption permit for each province that the load has to transit is required. Post-construction, standard transport will be used, except where a significant component might need to be replaced (i.e. damaged blade).

Provision for transport of abnormal loads, such as are required for the WEF, is contained in the National Road Transport Act (NRTA), and specifically in Section 81 of the NRTA, which reads as follows:

“Vehicle and load may be exempted from provisions of Act.

An MEC may, subject to such conditions an upon payment of such fees or charges as he or she may determine, authorise in writing, either generally or specifically, the operation on a public road of a vehicle which does not comply with the provisions of this Act or the conveyance on a public road of passengers or any load otherwise that in accordance with the provisions of this Act.”

When the movement of an abnormal load is considered to be in the economic and/or social interest of the country, an exemption permit may be issued to allow a vehicle(s) transporting such an abnormal load to operate on a public road for a limited period. The basic principles guiding this process are:

- An exemption permit for an abnormal load will only be considered for an indivisible load, abnormal in dimension and/or mass, where there is no possibility of transporting the load in a legal manner
- The damage to the road infrastructure by an abnormal vehicle has to be recovered from the carrier
- The risks to other users must be reduced to a level equivalent to what it would be without the presence of the abnormal vehicle on the road
- The conditions imposed must take the economic and/or social interest of the country and public at large into account

The WEF is anticipated to carry loads that are considered to be indivisible and are abnormal either dimensionally or in mass (or in both dimension and mass).

The WEF components are classified as an Abnormal Load and requires application to the Department of Transport and Public Works for a permit authorising the transport of the load.

14.3 Abnormal Load Transport

The following escort vehicles (whether it is the clients own escort vehicles or provincial traffic officer) will be necessary to escort the transportation of abnormal loads.

- For loads with a height of 4.70m measured from the ground requires 1 x Own Escort vehicle
- For loads of 5.50m + high Telkom Clearances are required for the lifting of overhead lines
- For loads of 5.80m + high Eskom Clearances are required for the lifting of overhead lines
- The “super-load” abnormal load vehicles transporting wind turbine components will require either 2 x Provincial Traffic Escorts or 1 x Provincial Traffic Officer Escort and 1 x Own Escort

While the N7 and N14 (proposed “N7” access route are generally of high standard and many of the structures have been assessed for load bearing capacity and height clearance in the past, the proposed WEF design (90 m blades) is particularly large and the route clearances will need due assessment. Where required, existing public roads may need to be upgraded and street furniture possible will need to be temporarily moved along the proposed equipment transport route to allow for the transportation and delivery of wind turbine components and other associated infrastructure components.

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

A comprehensive Transportation Plan must be undertaken prior to construction.

The Transportation Plan should include the following:

- Detailed assessment of the preferred “N7” route for transportation of WEF components from Saldanha Port to Site, and identification of alternative routes where necessary
- Identification of all load clearance issues and determine measures to address such (i.e., determine area for hardstands, temporary relocation of street furniture, impact on trees in vehicle turning circle, temporary closure of kerbside parking, temporary removal of median islands, etc.)
- Determine an effective transport strategy to minimise transportation impact on the road network (i.e. hold super-load / abnormal load vehicles transporting wind turbine blades ahead of a mountain pass, close the mountain pass for a limited period of time to allow abnormal load vehicles to travel in convoy through the mountain pass)
- Submit application for all relevant permits for abnormal loads and route clearances to 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 route immediately prior to WEF construction by carrying out a condition assessment or from recent pavement management system condition assessments, where available from the Provincial Authorities
- Place public notices regarding any planned abnormal load transports at the construction site to inform affected parties
- Ensure adequate escort of abnormal load transportation vehicles (this may exceed the TRH11 requirements of 2 x traffic officers)

- Ensure vehicles carrying abnormal loads 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
- Develop emergency procedures for possible transport incidents en-route to and on-site.
- Do a dry run of the Transportation Plan prior to implementation
- Create a monitoring / reporting system to ensure compliance with the Transportation Plan and to identify possible issues or incidents in order to facilitate improvements to the TMP

It is pointed out that the wind turbine specifications and particular transport requirements as well as the proposed site access on the N14 should be addressed in detail in the respective Transportation Plan and Traffic Management Plan.

The following monitoring activities must be carried out by the ECO:

- Conduct site audits and report non-compliance with the above-mentioned conditions

15 STORMWATER MANAGEMENT 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 (i.e. gabions etc.);
- Monitor for erosion during the clearing of vegetation;
- Avoid hard-engineered surfaces (i.e. 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; and
- Prevent surface run-off from areas of potential contamination.

16 EROSION MANAGEMENT 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.

16.3.3Erosion and Sediment Control Principles

The goals of erosion and sediment control during and after construction at the site must 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 must be closely linked to one another and must not operate independently, but must rather be seen as complementary activities within the broader environmental management of the site and must 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 must 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 must be minimized. Allied to this the fact that topsoil does not store well and must 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 must 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 must 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 must be provided such that downstream shrinkage of wetland width does not occur. Moreover, culverts must be aligned, as far impossible, with existing, natural channels.
- All crossings of drainage systems must 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 lead 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 must 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.

16.5.1 Diversion 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 must apply.

- Adequate culverts must be provided along the length of all roads to prevent diversion of flow from natural drainage lines.
- Culverts must be carefully located, such that outlet areas do in fact align with drainage lines.
- The downstream velocity of runoff must be managed, such that it does not result in downstream erosion – on steep slopes, where roads have been constructed on cut areas, allowance must 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 must 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 must 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 must 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 must 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 must 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 m to 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 must 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 must ensure that process equipment, controls, and procedures are designed, installed and maintained to safely operate the process
- All employees must understand the chemical and process hazards
- Facilities must 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.

Environmental Aspect	Action or Measure
	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.
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 AVIFAUNA MONITORING AND MANAGEMENT PLAN

19.1 Construction Phase Bird Monitoring Programme

Construction phase bird monitoring must be conducted in line with the current best practise guidelines[5] and applicable species specific guidelines (i.e. Verreaux’s Eagle guidelines[6]). Construction phase bird monitoring must be conducted throughout the entire construction phase of the WEF.

For the purposes of compiling this programme it assumed that the length of the construction phase will be 12 months, and hence this programme is based on a 12 month

[5] Birds and Wind-Energy Best-Practice Guidelines. Third Edition, 2015 (Jenkins et al. 2015).

[6] Verreauxs’ Eagle and Wind Farms-Guidelines for impact assessment, monitoring and mitigation. BirdLife SA, 2017.

period. The length (and scope) of the programme must be revised once the construction schedule has been finalised, and any additional pre-construction bird monitoring has been completed.

Construction phase monitoring must be conducted by an avifaunal specialist, and an Environmental Control Officer (ECO) must oversee activities and ensure that the site specific EMPR is implemented and enforced.

19.1.1 General Construction Phase Mitigation Requirements

- Construction activities must be conducted to reduce unnecessary destruction of habitat;
- High traffic areas and buildings such as offices, batching plants, storage areas etc. must where possible be situated in areas that are already disturbed and existing roads and farm tracks must be used where possible;
- The minimum footprint areas of infrastructure must be used wherever possible, including road widths and lengths;
- No turbines must be constructed in no-go areas, while associated infrastructure must be avoided where possible in these areas;
- Any clearing of trees (>3 m in height), especially stands of large alien trees (e.g. Blue Gum or Pine) on site must be approved first by an avifaunal specialist. Before, clearing, the location and description of the trees must be provided to the specialist, who may request the ECO to inspect the trees for any nests prior to clearing;
- The construction Phase ECO, the onsite Environmental Manager, and the client's representative on site (e.g. the resident engineer) are to be trained to identify Red Data and priority bird species, as well as their nests.
- 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 500 m of the breeding site must cease, and an avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed; and
- 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.

19.1.2 Avifaunal Walkthrough

- Prior to construction, an avifaunal specialist must conduct a site walkthrough, covering the final infrastructure layout and final turbine positions, to identify any nests/breeding activity of sensitive species, as well as any additional sensitive habitats within which construction activities may need to be excluded, particularly at certain times (e.g. breeding season).
- Should priority species nests be located, a protective buffer may be applied, within which construction activities may need to be restricted during the breeding season for that species.
- Following the specialist site walkthrough, any additional sensitive zones and no-go areas (e.g. nesting sites of Red Data species) are to be designated by the specialist who must advise on an appropriate buffer, within which construction activities may not occur during key breeding times.

19.1.3 Construction Phase Nest Surveys

- Appoint a specialist to design and conduct monitoring of the breeding of raptors at the various nests identified to date (and particularly the Martial Eagle nest 12 km west of the site and the Verreaux's Eagle nest south of the site). This monitoring must be conducted on two occasions (i.e. approximately in July and again in September) across each calendar year, during construction. The aim will be to monitor any disturbance to or displacement of the breeding birds during construction.

19.1.4 Reporting

- An avifaunal specialist must confirm the reporting requirements, but these must be in line with guideline requirements and reports must be submitted to relevant stakeholders in line with applicable guidelines. At least two construction phase bird monitoring reports should be produced per year.

19.2 Operational Phase Bird Monitoring Plan

The aim of the operational phase monitoring will be to determine the actual impacts of the WEF on avifauna. These impacts can then be assessed against observed activity of birds on site during the same time (and associated environmental conditions) that the impacts were realised. Operational monitoring is therefore critical to:

1. Determine the actual impacts of the WEF;
2. Determine if additional mitigation is required (adaptive management); and
3. Improve future assessments

19.2.1 General

Operational phase (i.e. post-construction) bird monitoring at the Paulputs WEF must commence once all turbines have been erected and the blades are turning. This may be during the commissioning phase, prior to the commercial operation date of the facility. An avifaunal specialist must be appointed to design the site specific monitoring methodology (e.g. exact survey locations, sampling frequencies and sampling times etc.) and to implement the monitoring plan.

Monitoring must be done in line with the latest best practise guidelines applicable at the time of monitoring commencing. Operational monitoring must have two components: Bird Activity Monitoring (BAM) and Carcass Searches (CS). In the first year, BAM and CS must run concurrently, and reporting must be combined where possible, allowing for the results of fatality monitoring to be interpreted against the results of the bird activity on the site over the same time period. The results of this monitoring and the carcass searchers in year one should advise the need for any additional ongoing activity monitoring or nest surveys beyond the first year month period. CS monitoring must continue regardless for the second and third year of operations, and then as a minimum must be conducted again in years 5, 10, 15, 20 and 25 of the facility.

Reports must be generated as part of operational monitoring programme and must be submitted to Birdlife SA, Endangered Wildlife Trust (EWT), Department of Environmental Affairs (DEA) and the relevant provincial environmental department/authority.

19.2.2 Bird Activity Monitoring

- Bird Activity Monitoring (BAM) must repeat the survey protocols used in pre-construction monitoring (amended where these are outdated, to be more in line with current best practise for pre-construction monitoring), over at least the first one year of operations.
- BAM must be conducted over at least four separate seasonal site surveys per 12 month period.
- BAM must include Vantage Point (VP) Surveys, from the same VP locations used during pre-construction monitoring (where possible), over at least 12 hours per VP per season.

- BAM must also include transect (walked and driven) surveys, incidental observations, and surveys of relevant focal sites including nest sites.

19.2.3 Carcass Searches

- Carcass Searches (CS) must be done for the first three years of operations. The need for further fatality monitoring (i.e. carcass searching) should then be reviewed, but at a minimum it must happen in year 5, 10, 15, 20, 25 etc. (i.e. every 5 years).
- Regular CS must cover 75% of all turbines or a minimum of 20 turbines. The turbine search interval should be determined by a specialist, in line with recorded scavenger rates at the site, but as minimum each turbine (selected for regular CS) must be searched every 7 days. Turbines not selected for regular CS, must be searched at least once per month.
- As a minimum, the radius of the search area below each turbine should be equal to 75 % of the turbine height (ground to vertical blade tip).
- In order to determine the probability of an observer detecting a carcass, a total of four searcher efficiency trials (i.e. one per season) must be conducted each year. Trials should be conducted for each individual or search pair, under the supervision of the avifaunal specialist.
- The rate of removal/decay of carcasses should be estimated by conducting scavenger removal trials (four sets of trials per year). Fresh carcasses (where possible) of birds of similar size (and species where possible) to the priority species on the site must be used where possible.
- Reporting should include fatality estimation based on the results of the scavenger and efficiency trials, and the actual number of fatalities recorded by the searchers.
- CS must also be conducted under any met masts and the grid connection powerline on a monthly basis.

19.2.4 Programme Revision

The above programme is based on current best practise and knowledge. At the time of commencement of the WEF operations, this programme must be reviewed by a bird specialist for relevance, and updated if/where required.

20 BAT CURTAILMENT PLAN

Curtailment, which involves limiting the amount of time turbine blades spin, is the most effective way to reduce residual impacts to bats whereas deterrent technology is still in testing stages and its effect on reducing bat fatality less known. A curtailment regime can be developed by examining the relationship between bats and meteorological conditions such as wind speed, temperature and humidity. For example, bat activity is typically supressed at higher wind speeds and increases with temperature. This information can be used to develop a curtailment schedule that can be applied when bat activity is high so that potential encounters by bats with wind turbine blades can be reduced. Meteorological data from the mast on site was used for this purpose.

Bat activity was highest in February, August and October and there may therefore be greater residual impacts to bats in these months. Therefore the relationship between meteorological conditions and bat activity was investigated in these months as they are the periods in which curtailment should be applied. Based on our analysis, curtailment should be applied during specific time periods and under specific meteorological conditions (Table 20) when bat fatality threshold are exceeded. For example, in February curtailment should be applied between four and five hours after sunset when the temperature is between 11 °C and 27 °C, or wind speed is between 4 ms^{-1} and 11 ms^{-1}, or relative humidity is between 20 % and 40 % if fatality threshold were exceeded. This curtailment plan is based on only one year of bat activity and must be updated based on additional data collected the operational phase of the development. The plan should be continuously refined and adapted based on incoming bat fatality data.

Table 20: Curtailment Parameters for the Paulputs Wind Farm

	February	August	October
Time Period	Between 4 and 5 hours after sunset	1 hour after sunset	Between 4 and 5 hours after sunset
Temperature (°C)	11 – 27	10 – 27	16 – 27
Wind Speed (ms^{-1})	4 – 11	4 – 13	5 – 13
Relative Humidity (%)	20 – 40	5 – 25	10 – 30

21 QUIVER TREE MONITORING PROGRAMME

Perhaps the plant species of greatest potential concern at the site is *Aloidendron dichotomum*. Although it is likely that individuals of this species can be avoided at the preconstruction stage, a greater long-term threat is likely to be illegal harvesting of young individuals associated with the greater access to the site resulting from the wind farm development. In order to limit, prevent and address any potential decline in this species, a long-term monitoring programme should be developed and initiated before construction. The programme should, at minimum, include the following parameters and activities:

- Size and GPS location of all *Aloidendron dichotomum* plants found on site. Photographs of all individuals present is also recommended for documentation purposes.
- Annual monitoring of size-class structure, including any new deaths, disappearances, and seedlings that have appeared.
- If any seedlings and young plants disappear, then the local populations should be supplemented with seedlings cultured from seed collected on-site.
- There should be signage present at all entrances to the site warning against the illegal collection of any fauna and flora.

The long-term *Aloidendron dichotomum* population monitoring programme must be submitted to Directorate and Department of Environment and Nature Conservation (DENC) for review and approval prior to implementation.

It is important to note that a permit from DAFF would be required for any impacts on nationally protected tree species, while a permit from DENC would also be required for general clearing and any clearing or removal of provincially protected species. These permits would be informed by a preconstruction walk-through of the final development footprint.

22 CHANCE FIND FOSSIL PROCEDURE

Should fossils be found on site during the construction phase the following procedure much be followed and a palaeontologist called to site.

<table>
<tr><td colspan="3">CHANCE FOSSIL FINDS PROCEDURE: Paulputs WEF and associated grid connection near Pofadder, Northern Cape Province</td></tr>
<tr><td>Province & region:</td><td colspan="2">Northern Cape, Kenhardt Magisterial District</td></tr>
<tr><td>Responsible Heritage Resources Authority</td><td colspan="2">SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa.
Phone: +27 (0)21 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za</td></tr>
<tr><td>Rock unit(s)</td><td colspan="2">Late Caenozoic alluvium along water courses</td></tr>
<tr><td>Potential fossils</td><td colspan="2">Bones, teeth and horn cores of mammals, freshwater molluscs, petrified wood, calcretised termitaria and other trace fossils</td></tr>
<tr><td rowspan="5">ECO protocol</td><td colspan="2">1. Once alerted to fossil occurrence(s): alert site foreman, stop work in area immediately (N.B. safety first!), safeguard site with security tape / fence / sand bags if necessary.</td></tr>
<tr><td colspan="2">2. Record key data while fossil remains are still in situ:
Accurate geographic location – describe and mark on site map / 1: 50 000 map / satellite image / aerial photo
Context – describe position of fossils within stratigraphy (rock layering), depth below surface
Photograph fossil(s) in situ with scale, from different angles, including images showing context (e.g. rock layering)</td></tr>
<tr><td>3. If feasible to leave fossils in situ:
Alert Heritage Resources Authority and project palaeontologist (if any) who will advise on any necessary mitigation
Ensure fossil site remains safeguarded until clearance is given by the Heritage Resources Authority for work to resume</td><td>3. If not feasible to leave fossils in situ (emergency procedure only):
Carefully remove fossils, as far as possible still enclosed within the original sedimentary matrix (e.g. entire block of fossiliferous rock)
Photograph fossils against a plain, level background, with scale
Carefully wrap fossils in several layers of newspaper / tissue paper / plastic bags
Safeguard fossils together with locality and collection data (including collector and date) in a box in a safe place for examination by a palaeontologist
Alert Heritage Resources Authority and project palaeontologist (if any) who will advise on any necessary mitigation</td></tr>
<tr><td colspan="2">4. If required by Heritage Resources Authority, ensure that a suitably-qualified specialist palaeontologist is appointed as soon as possible by the developer.</td></tr>
<tr><td colspan="2">5. Implement any further mitigation measures proposed by the palaeontologist and Heritage Resources Authority</td></tr>
<tr><td>Specialist palaeontologist</td><td colspan="2">Record, describe and judiciously sample fossil remains together with relevant contextual data (stratigraphy / sedimentology / taphonomy). Ensure that fossils are curated in an approved repository (e.g. museum / university / Council for Geoscience collection) together with full collection data. Submit Palaeontological Mitigation report to Heritage Resources Authority. Adhere to best international practice for palaeontological fieldwork and Heritage Resources Authority minimum standards.</td></tr>
</table>

23 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.

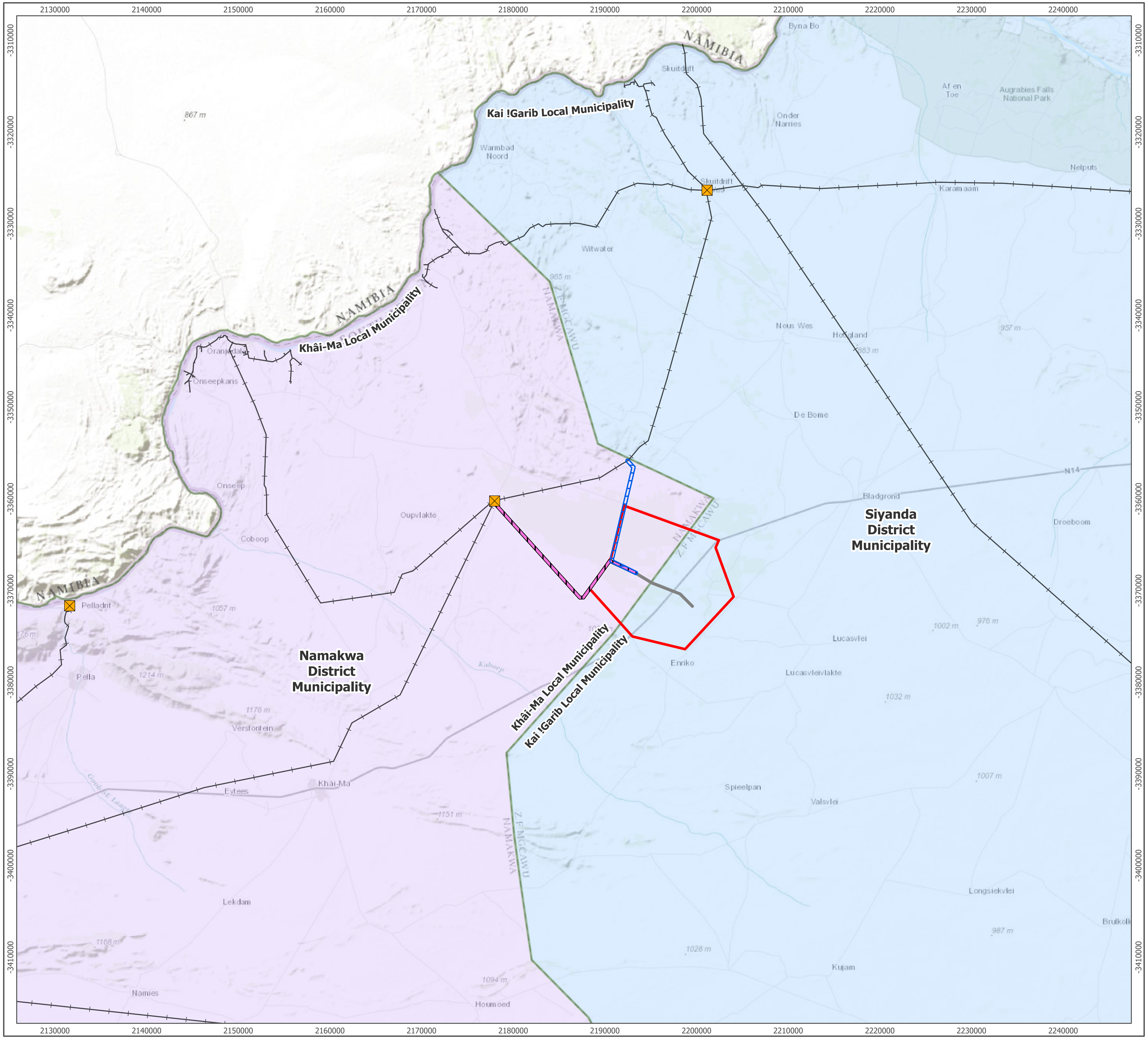
Eskom will be responsible for the decommissioning phase, should the transmission line be decommissioned. This will include unstringing the power line cables, disassembling the towers, removing the foundations and rehabilitating the servitude according to this EMPR.

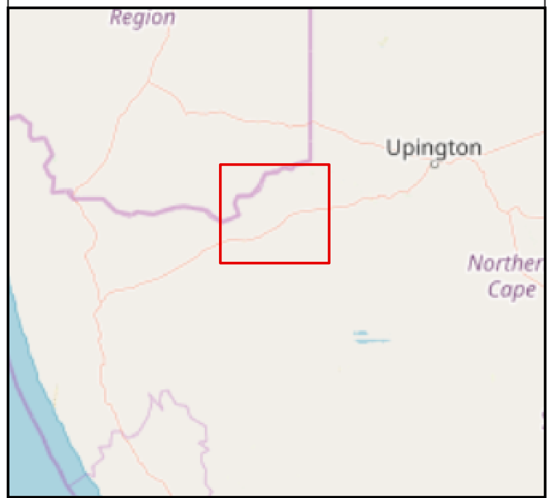
24 CONCLUSION

In terms of the National Environmental Management Act, 1998 (Act No. 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 environmental management is well implemented, and a set of operational guidelines are developed by the long term site management body.





ARCUS

- Paulputs WEF Site Boundary
- Existing Eskom Substation
- Existing Eskom Transmission Lines
- Grid Connecting Substation Options A, B, C
- Grid Option A
- Grid Option B
- Grid Option C
- Local Municipality Boundary
- Namakwa District Municipality
- Siyanda District Municipality

1:400,000 Scale @ A3

0 10 20 km NORTH

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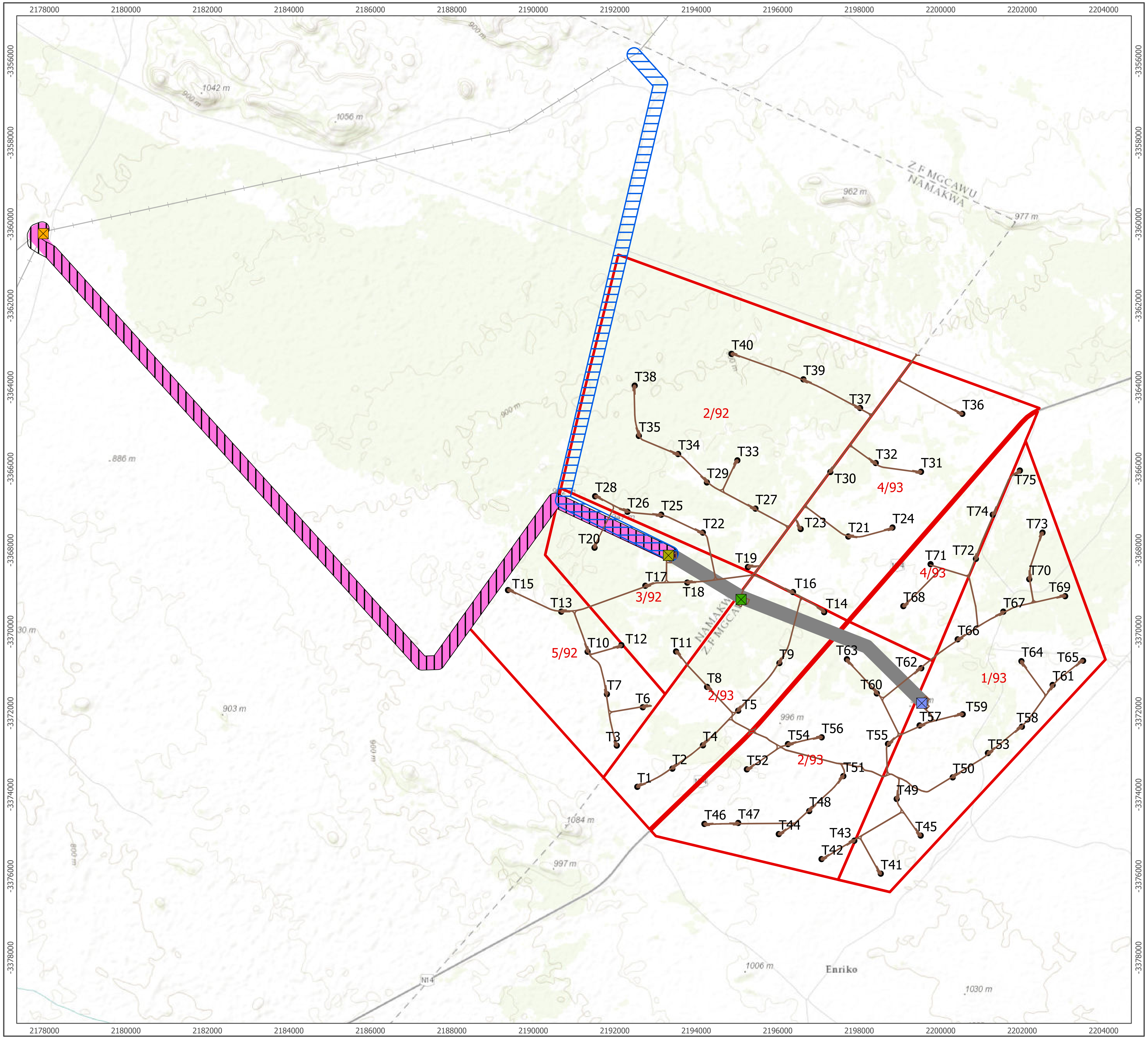
Checked By: JA	Date: 16/07/2019

Site Location
Figure 1

Paulputs WEF
EMPr



ARCUS

- Farm Portions
- Turbine Layout
- Existing Eskom Substation
- Substation Compound Option A
- Substation Compound Option B
- Substation Compound Option C
- Existing Eskom Transmission Lines
- Roads, Hardstands and Substations
- Grid Connecting Substation Options A, B, C
- Grid Option A
- Grid Option B
- Grid Option C

1:90,000 Scale @ A3

0 2 4 km

NORTH

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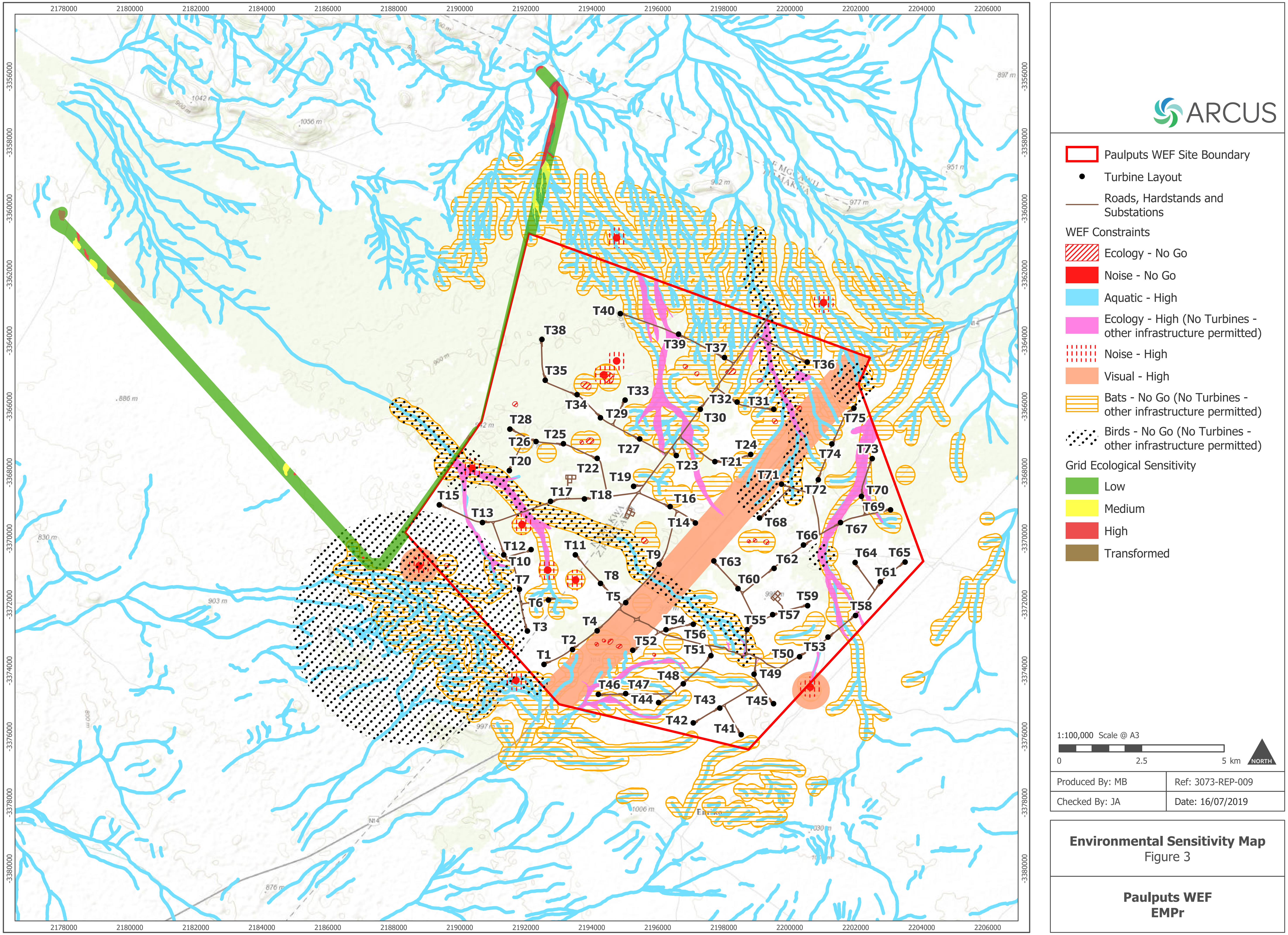
Proposed Development Plan
Figure 2

Paulputs WEF
EMPr



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Checked By: JA | Date: 16/07/2019

Environmental Sensitivity Map
Figure 3

Paulputs WEF
EMPr