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Ref: Amendment to authorised the Karusa Wind Energy Facility (WEF)

Savannah Environmental (Pty) Ltd
PO Box 148
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Attention: Ms Tebogo Mapinga

Dear Madam,

ECOLOGICAL COMMENTS: PROPOSED AMENDMENT TO THE AUTHORISED KARUSA WIND ENERGY FACILITY (DEA REF 12/12/20/2370/1) – AMENDMENTS TO TURBINE SPECIFICATIONS AND FACILITY LAYOUT.

The original Ecological Assessment/Report was conducted by Dr. David Hoare (Specialist ecological study on the potential impacts of the proposed Hidden Valley Wind Energy Facility Project near Matjiesfontein, Northern Cape – 17 March 2012). Ecological comments were requested from Eco-Care Consultancy by Savannah Environmental regarding the proposed amendments to the Karusa WEF. The following amendments to the project have been proposed by Karusa Wind Farm (Pty) Ltd;

- Rotor diameter: From 120m to up to 150m
- Generating capacity per turbine: From 2 - 3.5MW to 4.5MW
- Amount of Turbines: Reduce from 57 turbines to 43 turbines
- Location of Turbines: Slight amendment to the location of turbines and associated infrastructure.

The hub height of 120m for each turbine will however remain unchanged.

Subsequently the aim and terms of reference is to:

- Determine whether the impacts assessed within the original Ecological Assessment still ring true for the amended layout and infrastructure;

- In the case where such impacts will change in any way due to the proposed amendments (in terms of duration, magnitude, significance etc.), a comparison should be provided of such impacts before the changes and after the proposed changes;
- Whether there will be any additional impacts;
 - In the case where there will be additional impacts, such impacts should be assessed following the methodology specified by Savannah Environmental.
- Determine any potential advantages and/or disadvantages associated with the changes;
- Provide measures to ensure avoidance, management and mitigation of impacts associated with such proposed changes, and any changes to the existing EMPr.

1. GENERAL FINDINGS/NOTES ON THE AFFECTED ENVIRONMENT, AND COMPARISON WITH FINDINGS FROM THE ORIGINAL ECOLOGICAL REPORT.

Due to the fact that this area falls within an endemic plant centre (Hantam-Roggeveld Centre of Endemism) and due to the general high species turnover along highly varying (diverse) topographical gradients, it was deemed necessary to conduct for a site visit in order to accurately determine the potential impacts and their significance as well as to recommend appropriate mitigation and management measures in order to avoid and/or decrease the significance of such impacts.

The Karusa WEF development area was surveyed from 18 to 20 September 2017. Currently the area is experiencing a drought with little precipitation occurring during the winter months.

1.1. The following findings were made during the site visit.

All of the proposed amendments (number of turbines, technical specification and location) will occur within a singular vegetation type as classified by Mucina & Rutherford (2006) namely; Central Mountain Shale Renosterveld. This area is furthermore consistent with the *Oedera genistifolia* – *Dicerothamnus rhinocerotis*. According to Mucina and Rutherford (2006) this vegetation type is classified as Least Threatened with only 1% being already transformed. Furthermore, this vegetation is not listed within the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). However, due to the relative small extent of this vegetation type (1 236km²), the fact that numerous renewable energy projects is proposed for the area (according to DEA-registered projects), of which most will be concentrated along the escarpment (the core of this vegetation type), the impacts within this vegetation unit will be more profound. Such WEF developments include the Inca Komsberg, Kareebosch as well as Karusa WEFs. Cumulative impacts on especially the Central Mountains Shale Renosterveld

appear to be of concern due to its limited distribution and the fact that a significant portion, especially in the west is within renewable energy development application areas.

A summary of the general vegetation found within the affected habitats as well as Red Data and Protected species are provided below:

Affected Habitats

a. Plateaus and escarpments

These low mountains have relatively level to slightly uneven plateaus. Where soil is less gravelly and rocky the dominant vegetation is made up of mainly tall shrubs consistent of natural renosterveld. The rocky escarpment and where rock beds are exposed these tall shrubs are replaced by dwarf shrubs, grasses and a number of geophytes and succulents. The tall shrubby vegetation includes; *Oedera genistifolia*, *Euryops laterifloris*, *Dimorphotheca cuneata*, *Rosenia glandulosa*, *Rosenia spinescents*, *Eriocephalus punctulatus*, *Ruschia cradockensis* subsp. *triticiformis*, *R. spinosa* and *Lampranthus uniflorus*.

Some of these level plateaus have been trampled and grazed by sheep to an extent that *Ruschia cradockensis* has become an encroaching species forming almost mono stands within these areas.

Sandy areas along the plateau section may contain moderately large populations of *Drimia capensis* and *Drimia altissima* (geophytes).

Large boulders and stones create micro-habitats for species preferring cooler, moist and shaded habitats. Such habitats may also be created by larger, dense shrubs. Species associated with such micro-habitats include; *Crassula umbella*, *C. barbata*, *Lachenalia anguinea*, *Colchicum longipes*, *Bulbinella cauda-felis*, *Holothrix aspera*, *Disperis purpurata* subsp. *purpurata* and *Pterygodium schelpei*.

b. Shrubby Succulent Rocky Patches

These exposed rock beds and outcroppings occur as patches mostly along the south-eastern mid and upper slopes and along the escarpment and plateaus. These patches can be regarded as unique habitats differing in species composition from the surrounding, largely homogenous renosterveld and subsequently contribute to habitat and species diversity. A few species were found that are highly restricted to these rockeries. The vegetation of this unit can be described as a low shrubby type of unit dominated by shrubs such as *Pteronia pallens*, *Zygophyllum pygmaeum*, *Rosenia glandulosa*, *Dimorphotheca cuneata*, *Eriocephalus microphyllous*, *E. ericoides*, *Helichrysum rosum* and *Euryops*

multifidus. A prominent feature within this unit is the presence of grass species such as *Merxmuellera stricta*, *Enneapogon scaber* and *Ehrharta* spp. and an abundance and high diversity of geophytes and succulents. Probably the most prominent species occurring in these areas are the succulent shrubs *Ruschia cradockensis* subsp. *triticiformis* and *R. spinosa*. The succulent family Mesembryanthemaceae is well represented and includes *Antimima pumila*, *Antimima prolongata*, *Antimima* spp 1, *Antimima* spp 2, *Cheiridopsis namaquensis*, *Erepsia* spp. (*E. saturata*?), *Lampranthus uniflorus*, *Cleretum papulosum* subsp. *papulosum*, *Drosanthemum* spp. and *Conophytum uviforme* subsp. *uviforme*. Another succulent family well represented is Crassulaceae and include the following species; *Tylecodon reticulatus*, *T. wallichii*, *T. ventricosus*, *Tylecodon* spp. *Crassula deltoidea*, *C. columnaris*, *C. nudicaulis*, *C. barbata*, *C. muscosa*, *C. nudicaulis*, *C. pubescens*, *C. brevifolia*, *Adromischus filicaulis* and *Adromischus* spp. The rich geophytic component of these rocky areas include a diversity of Iridaceae species such as; *Romulea atrandra*, *R. tortuosa*, *Hesperantha acuta*, *H. humilis*, *H. marlothii*, *Babiana virginea*, *Moraea fugax*, *Lapeirousia* spp. Other geophytic species include *Oxalis luteola*, *O. obtusa*, *O. melanosticta*, *Brunsvigia* spp. (*B. herrei* and/or *B. bosmaniae*), *Wurmbea variabilis* and *Lachenalia anguinea*.

c. Slopes of the low mountains

The vegetation along the slopes of the low mountains are generally relative homogenous, most likely due to the gravelly substrate which dominates these areas. There are however slight differences between the south/south-east and north / north-east facing slopes where the latter is a bit drier and is subsequently more sparse and dominated by lower growing shrubs. A unique feature of the slopes and especially the south/south-east facing slopes are the rocky patches and exposed rock beds, although this will be discussed as a separate habitat. Typical vegetation include, *Dicrothamnus rhinocerotis*, *Euryops laterifloris*, *E. multifidus* *Oedera genistifolia*, *Dimorphotheca cuneata*, *Aspalathus* spp., *Pteronia aspalatha*, *Pteronia glauca*, *P. glomerata*, *P. incana*, *Rosenia spinescens*, *Eriocephalus punctulatus* and *Eriocephalus africanus* var. *punculatus*. The herb layer and ground covering is poorly developed and grass species are largely absent with the exception of the more rocky areas. The more rocky areas contain a higher abundance of wiry grasses such as *Merxmuellera stricta*, *Ehrharta calycina* and *Pentastichistis eriostoma*. *Euryops laterifloris* is also more dominant. Other species regularly found included; *Montinia caryophyllacea*, *Tylecodon wallichii*, *Ornithogalum* spp., *Hermannia cuneifolia*, *Pelargonium abrothanifolium*, *P. carnosum*, *Drimia capensis*, *D. altissima*, *Romulea atrandra*, *Ruschia cradockensis* and *Crassula umbrellae*.

The adjusted turbine locations, which are limited in number, have been placed within the more level, less rocky areas along the escarpment/plateau, subsequently avoids the more sensitive rocky areas. Most of these flatter portions are prone to overgrazing and trampling by sheep and have been slightly transformed with *Ruschia cradockensis*, *R. spinosa* becoming more prominent. Furthermore, fewer total turbine numbers result in less natural areas/vegetation being transformed. These areas are also less exposed to erosion although erosion is still regarded as a significant threat. Subsequently it can be concluded that the adjusted layout and infrastructure design can be regarded as a positive improvement. As the development is still located within the same vegetation type and within similar habitat types, the recommendations and mitigation measures pertaining to vegetation rehabilitation within the existing Plant Search and Rescue and Rehabilitation Management Plan (September 2015) are still applicable for the new layout and should be adhered to.

Red Data and Protected Plant Species

Within the original Ecological Assessment, Red Data species and species which are protected within national and/or provincial legislation and which have been recorded within the relevant quarter degree grid have been listed. Furthermore, of these species, five were regarded as likely to occur within the study area namely; *Romulea eburnea* (Vulnerable), *Lotononis venosa* (Vulnerable), *Geissorhiza karooica* (Vulnerable), *Cleretum lyratifolium* (Rare) and *Strumaria karooica* (Rare).

It is important to take note that the revised layout will not result in an increase or decrease on the impacts relating to the above mentioned red data species as well as red data and protected species mentioned below, with the impacts remaining the same.

The following species were recorded during this survey of the adjusted turbine locations.

a. Red List Species

As listed within the Listed Red List species of South African Plants (Raimondo et al. 2009). An updated list is available from the SANBI website (<http://redlist.sanbi.org/>).

- *Drimia altissima*: Declining

D. altissima is an abundant species that occur within sandy areas along the escarpment as well as slopes (especially the drier slopes). The development will not have a significant impact on the status of this species as populations were recorded outside of the new proposed development area. This geophytic species

are capable of surviving some form of disturbance and will likely only be lost where concrete surfaces will be present and frequently driven access roads.

b. Protected Species

Species which are protected within National Environmental: Biodiversity Act (Act No. 10 of 2004) – NEM:BA; Northern Cape Nature Conservation Act of 2009 (Act 9 of 2009) as well as within the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Appendix I,II and III.

- *Aloe microstigma*: NCNCA, CITES II
- *Cheridopsis namaquensis*: NCNCA
- *Antimima pumila*: NCNCA
- *Cleretum papulosum*: NCNCA
- *Antimima aristulata*: NCNCA
- *Erepsia spp.*: NCNCA
- *Antimima spp.1*: NCNCA
- *Lampranthus unifloris*: NCNCA
- *Ruschia cradocensis*: NCNCA
- *Ruschia spinosa*: NCNCA
- *Haemanthus coccineus*: NCNCA
- *Brunsvigia bosmaniae*: NCNCA
- *Colchicum spp 1.*: NCNCA
- *Colchicum coloratum*: NCNCA
- *Colchicum longipes*: NCNCA
- *Adromischus triflorus*: NCNCA
- *Crassula umbella*: NCNCA
- *Crassula barbata*: NCNCA
- *Crassula brevifolia*: NCNCA
- *Crassula columnaris*: NCNCA
- *Crassula deltoidea*: NCNCA
- *Crassula nudicaulis* var. *platyphylla*: NCNCA
- *Tylecodon reticulatus*: NCNCA
- *Tylecodon ventricosus*: NCNCA
- *Pelargonium alchemilloides*: NCNCA
- *Drimia capensis*: NCNCA
- *Romulea atrandra*: NCNCA
- *Romulea diversiformis*: NCNCA
- *Romulea tortuosa*: NCNCA
- *Hesperantha marlothii*: NCNCA
- *Babiana flabellifolia*: NCNCA
- *Oxalis obtusa*: NCNCA

- *Oxalis luteola*: NCNCA
- *Holothrix aspera*: NCNCA, CITES II
- *Disperis purpurata subsp. purpurata*: NCNCA, CITES II
- *Pterygodium schelpei*: NCNCA, CITES II
- *Wurmbea variabilis*: NCNCA

Most of these species have been identified and discussed within the detailed Ecological Walk-Through Report of the facility (Authorised Karusa Wind Energy Facility: Pre-Construction Commencement Ecological Walk-Through Report – October 2015). Most of these species are common along the escarpment and where habitat is suitable may be abundant. However, within most of the newly selected locations for the turbines, these species occurred in lower densities as most of the locations were selected within more level, less rocky areas along the escarpment/plateau. Most of these protected succulents and geophytes are associated with more rocky/gravelly areas whereas these flatter sections along the escarpment are prone to grazing and trampling by sheep. Furthermore, fewer turbines result in fewer areas impacted and thus lower potential of protected and red data species impacted. Thus it can be concluded again that the adjusted layout and infrastructure design can be regarded as a positive improvement.

The recommendations within the Ecological Walk-Through Report as well as the Plant Search and Rescue and Rehabilitation Management Plan (September 2015) regarding these species are still applicable and should be implemented as requested. Additional species that were recorded within the new development footprint areas and which should be included in the Plant Search and Rescue Management Plan include:

- *Disperis purpurata subsp. purpurata* (±1000 individual species)
 - Relative small Orchid species which occur singularly or in small population of not more than 8 species, confined to shaded, cooler and more moist areas created by large stones and boulders as well as large shrubs.
 - Plants are not visible above-ground for most of the year and only appear and flower for a short period in spring. Bulbs are relative small and should be removed as earthworks commence.
 - Store in a dark dry place (in PAPER or HESSIAN bags) until they can be replanted.
 - Aim to find and rescue at least 80%.



- *Pterygodium schelpei* (\pm 1700 individual species):
 - Relative small Orchid species which tend to occur locally in populations of between 15 to 35 species, underneath large shrubs and cooler, more moist micro-habitats created by large stones and boulders.
 - Plants are not visible above-ground for most of the year. Leaves may be present for relative long periods of time (late winter to early summer), although flowering time is very short during spring. Bulbs are relative small and should be removed as earthworks commence.
 - Store in a dark dry place (in PAPER or HESSIAN bags) until they can be replanted.
 - Aim to find and rescue at least 80%.



- *Wurmbea variabilis* (\pm 200 individual species):
 - Relative small geophyte which tend to prefer more open sandy to sandy-loam, often stony soil comprising of lower growing shrubs.
 - Plants are not visible above-ground during dry season. Bulbs are relative small and should be removed as earthworks commence.
 - store in a dark dry place (in PAPER or HESSIAN bags) until they can be replanted.
 - aim to find and rescue at least 20 - 50%.



The various micro-habitats created along the escarpment allow for a variety of faunal species to inhabit this escarpment. Most of the larger, more mobile species such as hares, rodents and other mammal species will be able to move away rapidly from construction activities. However, smaller burrowing animals, and slow-moving reptiles such as tortoises and species restricted to certain niches/micro-habitats will have to be moved to outside the construction area if and where necessary. A summary of important faunal species recorded within the affected environment are provided below:

Faunal Species

a. Red Data Species

Within the original Ecology Report three species of conservation concern mentioned, which have a distribution that coincide with the study area namely; Riverine Rabbit (*Bunolagus monticularis*) –Critically Endangered, Lesueur’s wing-gland bat (*Cistugo lesueuri*) – Near Threatened and the Honey Badger (*Mellivora capensis*) – Near Threatened. Due to the absence of suitable habitat it is highly unlikely that Riverine Rabbit will occur within the study area. Lesueur’s winged-gland bat prefers broken terrain at high-altitude with suitable rock crevices and water in the form of dams, rivers and marshes. Due to the scarcity of such water sources within the study area it is also highly unlikely that important populations will persist within the study area. Although the Honey Badger has a very wide distribution and habitat preference, these species are usually sparsely distributed and there is only a slight likelihood that such a species will occur within the study area. Honey badgers are highly mobile species and will move away at the onset of any human activities.

The original Ecology Report also mentioned two reptile species and no amphibian species of conservation concern that have a distribution that includes the study area and which could occur on site. These reptilian species are; Armadillo Girdled Lizard (*Ouroborus cataphractus*) – Vulnerable, and Namaqua Plated Lizard

(*Gerrhosaurus typicus*) – Near Threatened. None of these species were observed within the study area, although preferred habitat is present throughout the development area.

b. Protected Species

Species which are protected within National Environmental: Biodiversity Act (Act No. 10 of 2004) – NEM:BA; Northern Cape Nature Conservation Act of 2009 (Act 9 of 2009) as well as within the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Appendix I,II and III.

The only protected mammals noted within the escarpment included:

- A small family (3 individuals) of bat-eared foxes (*Otocyon megalotis*) - between wind turbines K31 and K32.
- Latrines of Hewitt's Red Rock Rabbit (*Pronolagus saundersiae*).
- Small earth mounds as a result of sub-surface digging activities of the Common (African) Mole Rat (*Cryptomys hottentotus*) – deeper sandy patches.

Bat-eared foxes as well as Hewitt's Red Rock Rabbit are both mobile animals that will move away with the onset of the construction phase and may return to some areas during the operational phase. Common Mole Rat is sensitive to soil tremors and disturbances and will also likely move away from construction areas. Where such species are however exposed during construction, these species may not be harmed and mitigation measures recommended for slow moving and burrowing animals should be implemented. All management and mitigation measures recommended within the Search and Rescue Management Plan pertaining to mammals species found within the study area has relevance and should be enforced and adhered to.

Seven protected reptile species have been noted within the development footprint and included:

- A fairly large population of Karoo Girdled Lizard (*Karusasaurus polyzonus*) of approximately 30 – 40 individuals (can be more) – well vegetated rocky areas between turbines K30 and K29 (This species is also a South African Near Endemic).



- Southern Rock Agama (*Agama atra*) – associated with the same habitat as the Karoo Girdled Lizard (This species is also a South African Near Endemic).



- Angulate Tortoise (*Chersina angulata*) – associated with more gradual sandy landscape along the escarpment and especially lower lying plains and valleys.



- Remains of Greater Padloper Tortoise (*Homopus femoralis*) – near turbine K21 (This is a South African Endemic Species).
- Tent Tortoise (*Psammobates tentorius*) – observed within the lower lying and more gradual footslopes and valleys and may be impacted by access roads to the wind turbines.



- Spotted Skaapsteker Snake (*Psammophylax rhombeatus rhombeatus*)



- Crossed Whip Snake (*Psammophis crucifer*) – observed within the lower lying and more gradual footslopes but may occur along the escarpment (This is a South African Near Endemic).

One protected arachnid species have been recorded within the development footprint and included:

Baboon Spider (*Idiothele nigrofulva*) – prefer deeper sandy soils between turbines K7 – K10, K12 –K13 and K28 – K30. This species construct silk-lined burrows (sometimes under stones), normally with a waferlike trapdoor, although the burrows noted within the development area did not contain any trapdoors. Burrows of males may be between 2 and 2.5cm whilst female burrows are between 4 and 5cm.



Impacts on these species can be avoided if the recommended management and mitigation measures are enforced and implemented. Tortoises and girdled lizards are especially prone to illegal collection and the appointed environmental management officer (ECO) / environmental officer (EO) as well as site managers should be aware of this potential threat. The habitat of the Karoo Girdled Lizard population should be left undisturbed as far as possible. The only disturbance that can be allowed is within the construction footprint areas for Wind Turbines K30 and K29. These areas should be thoroughly inspected and any potential species should be relocated to the rocky areas between the two turbine sites by an appropriate person (ECO or EO). All turbine sites should also be thoroughly investigated for any baboon spider burrows. Active nests should be identified (nests still lined with fresh silky webs) and all spider species located within the development footprint area should be carefully dug up by the ECO/EO (burrows normally 60 – 70cm deep) and the species be translocated.

2. COMPARISON AND ASSESSMENT OF POTENTIAL IMPACTS LISTED WITHIN THE ORIGINAL ECOLOGICAL REPORT

A summary of all applicable impacts listed within the original Ecology Report will be provided followed by a re-assessment of all impacts that that will either increase or decrease in significance following the amendment of the turbine design and location. All impacts that will have no change in significance will only be mentioned. Additional mitigation measures are provided where deemed necessary.

Within the original Ecology Report the following potential impacts were listed as applicable to this development.

- **"Impacts on biodiversity:** *this includes any impacts on populations of individual species of concern (flora and fauna), including protected species, and on overall*

species richness. This includes impacts on genetic variability, population dynamics, overall species existence or health and on habitats important for species of concern”.

Within the report the following biodiversity aspects were deemed to be potentially significant if not mitigated against:

- » Impacts on bats: Bat deaths due to direct strikes from wind turbines and barotrauma, where bats are killed when suddenly passing through a low air pressure region surrounding the turbine blade tips causing low pressure damage to the bat's lungs.

The following consequences may occur if the infrastructure is located in such a manner that individuals or populations of such species will be negatively impacted:

1. fragmentation of populations of affected species;
2. reduction in area of occupancy of affected species; and
3. loss of genetic variation within affected species.

This may ultimately lead to a negative change in the conservation status of the affected species, which implies a reduction in the chances of the species overall survival chances.

All approved turbines and related infrastructure were located outside of bat sensitive areas with impacts to bats having been considered to be low.

- » Impacts on threatened animals: Threatened animal species are affected primarily by the overall loss of habitat, since direct construction impacts can often be avoided due to movement of individuals from the path of construction.

In the case of threatened animal species, a loss of a population or individuals at a mass scale could lead to a direct change in the conservation status of the species, possibly extinction. This may arise if the proposed infrastructure is located where it will impact on such individuals or populations or the habitat that they depend on. Consequences may include:

1. fragmentation of populations of affected species;
2. reduction in area of occupancy of affected species; and
3. loss of genetic variation within affected species.

It must be noted however that all approved and adjusted turbines and related infrastructure are located outside of sensitive areas with no risk to a direct change in the conservation status of the species or extinction.

- » Impacts on threatened plants: Plant species are especially vulnerable to infrastructure development due to the fact that they cannot move out of the path of the construction activities, but are also affected by overall loss of habitat.

In the case of threatened animal species, a loss of a population or individuals at a mass scale could lead to a direct change in the conservation status of the species, possibly extinction. This may arise if the proposed infrastructure is located where

it will impact on such individuals or populations or the habitat that they depend on. Consequences may include:

1. fragmentation of populations of affected species;
2. reduction in area of occupancy of affected species; and
3. loss of genetic variation within affected species.

It must be noted however that all approved and adjusted turbines and related infrastructure are located outside of sensitive areas with no risk to a direct change in the conservation status of the species or extinction.

- **Impacts on sensitive habitats:** *this includes impacts on any sensitive or protected habitats, including, for example, indigenous forest, thicket and wetland vegetation, that leads to direct or indirect loss of such habitat.*
- **Impacts on ecosystem function:** *this includes impacts on any processes or factors that maintain ecosystem health and character, including the following:*
 - *disruption to nutrient-flow dynamics;*
 - *impedance of movement of material or water;*
 - *habitat fragmentation;*
 - *changes to abiotic environmental conditions;*
 - *changes to disturbance regimes, e.g. increased or decreased incidence of fire;*
 - *changes to successional processes;*
 - *effects on pollinators;*
 - *increased invasion by alien plants.*

Changes to factors such as these may lead to a reduction in the resilience of plant communities and ecosystems or loss or change in ecosystem function.

Within the report the following aspects pertaining to impacts on sensitive habitats and ecosystem functions were deemed significant:

- » **Impacts on indigenous natural vegetation (terrestrial):** Construction of infrastructure may lead to direct loss of vegetation. This will lead to localised or more extensive reduction in the overall extent of renosterveld vegetation. Where this vegetation has already been stressed due to degradation and transformation at a regional level, the loss may lead to increased vulnerability (susceptibility to future damage) of the habitat. Consequences of the impact occurring may include:
 1. Negative change in conservation status of habitat (Driver et al. 2005);
 2. increased vulnerability of remaining portions to future disturbance;
 3. general loss of habitat for sensitive species;
 4. loss in variation within sensitive habitats due to loss of portions of it;
 5. general reduction in biodiversity;
 6. increased fragmentation (depending on location of impact);
 7. disturbance to processes maintaining biodiversity and ecosystem goods and services; and
 8. loss of ecosystem goods and services.

It must be noted however that all approved and adjusted turbines and related infrastructure are located outside of sensitive areas. All impacts will be adequately mitigated by the adherence to the approved EMPr.

- » Impacts on wetlands and watercourses: Construction may lead to some direct or indirect loss of or damage to seasonal marsh wetlands or drainage lines or impacts that affect the catchment of these wetlands. This will lead to localised loss of wetland habitat and may lead to downstream impacts that affect a greater extent of wetlands or impact on wetland function. Where these habitats are already stressed due to degradation and transformation, the loss may lead to increased vulnerability (susceptibility to future damage) of the habitat. Physical alteration to wetlands can have an impact on the functioning of those wetlands. Consequences may include:

1. Increased loss of soil;
2. loss of or disturbance to indigenous wetland vegetation;
3. loss of sensitive wetland habitats;
4. loss or disturbance to individuals of rare, endangered, endemic and/or protected species that occur in wetlands;
5. fragmentation of sensitive habitats;
6. impairment of wetland function;
7. change in channel morphology in downstream wetlands, potentially leading to further loss of wetland vegetation; and
8. reduction in water quality in wetlands downstream of road.

It must be noted however that all approved and adjusted turbines and related infrastructure are located outside of sensitive areas with no risk to a direct change in the conservation status of any wetland or watercourse. All impacts will be adequately mitigated by the adherence to the approved EMPr.

- » Establishment and spread of declared weeds and alien invader plant: Major factors contributing to invasion by alien invader plants includes high disturbance. Exotic species are often more prominent near infrastructural disturbances than further away (Gelbard & Belnap 2003, Watkins *et al.* 2003). Consequences of this may include:

1. Loss of indigenous vegetation;
2. change in vegetation structure leading to change in various habitat characteristics;
3. change in plant species composition;
4. change in soil chemical properties;
5. loss of sensitive habitats;
6. loss or disturbance to individuals of rare, endangered, endemic and/or protected species;
7. fragmentation of sensitive habitats;
8. change in flammability of vegetation, depending on alien species;
9. hydrological impacts due to increased transpiration and runoff; and
10. impairment of wetland function.

It must be noted however that spread of declared weeds and alien invader plants will be minimised and not considered a high risk. All impacts will be adequately mitigated by the adherence to the approved EMPr.

- **Secondary and cumulative impacts on ecology:** *this includes an assessment of the impacts of the proposed project taken in combination with the impacts of other known projects for the area or secondary impacts that may arise from changes in the social, economic or ecological environment.*
- **Impacts on the economic use of vegetation:** *this includes any impacts that affect the productivity or function of ecosystems in such a way as to reduce the economic value to users, e.g. reduction in grazing capacity, loss of harvestable products. It is a general consideration of the impact of a project on the supply of so-called ecosystem goods and services.*

SITE VISIT OBSERVATIONS: FINDINGS OF FIELD SURVEY FOR AMENDMENT APPLICATION

Following a site visit of the new wind turbine locations, as well as taking into account the new turbine design (larger rotors), the following comments can be made regarding the above mentioned impacts:

- » **Impacts on threatened animals:** No red data mammals were recorded within the amended development areas although there is a slight likelihood for species such as the Honey Badger to occur within the study area. Most mammals recorded within the study area are mobile and will likely move away at the onset of the construction phase. The aspects relating to the impacts (Extent, Duration, Magnitude, Probability and Significance) on such mammals are regarded to be similar to that within the original Ecology Report. Similarly, no red data reptiles were recorded within the amended development area, however a few protected species (within the provincial legislation) which are regarded as passive, slow moving species and/or species which are habitat specific and may be vulnerable to the disturbance and habitat destruction within the new development footprint area. Such species include the various tortoise species identified as well as the population of Karoo Girdled Lizard. This, is also applicable to the baboon spider population (Arachnidae) identified within the development area. Due to such species being potentially vulnerable to such habitat disturbance, this impact will be re-assessed and compared with the assessment from the original report. Even though the significance of this impact is slightly higher, it can still be successfully mitigated, subsequently avoiding detrimental impacts on these populations and as such the new amended positions are regarded as acceptable.
- » **Impacts on threatened plants:** Only one red data species have been recorded within the study area namely *Drimia altissima* (VU). This species is however abundant within the region and occurred over a wide area throughout the study

area with larger populations recorded outside of the development area and as such the impact on these species is regarded as relative low. Numerous protected species (protected within the NCNCA) have been recorded along the escarpment and within the development footprint areas. The aspects relating to the impacts (Extent, Duration, Magnitude, Probability and Significance) on such plants are regarded to be similar to that within the original Ecology Report. As such, a re-assessment of this impact is not deemed necessary. The recommendations within the Ecological Walk-Through Report (October 2015) as well as the Plant Search and Rescue and Rehabilitation Management Plan (September 2015) regarding these species are still applicable and should be implemented as requested. Additional species that were recorded within the new development footprint, have already been discussed earlier this report, should be included in the Plant Search and Rescue Management Plan.

- » Loss or fragmentation of indigenous natural vegetation: The aspects relating to the impacts (Extent, Duration, Magnitude, Probability and Significance) on indigenous natural vegetation are regarded to be largely similar to that within the original Ecology Report. However, due to a decrease in the amount of turbines, the total area being disturbed will subsequently decrease. This in turn will result in a decrease in the significance of this impact (fracturing and loss of natural vegetation) and as such this impact will be re-assessed and compared with the original assessment. The recommendations within the Ecological Walk-Through Report (October 2015) as well as the Plant Search and Rescue and Rehabilitation Management Plan (September 2015) regarding the rehabilitation and management of disturbed areas as well as the protection against soil erosion are still applicable and should be implemented as requested.

- » Establishment and spread of declared weeds and alien invader plants: The aspects relating to the impacts (Extent, Duration, Magnitude, Probability and Significance) associated with the establishment and spread of declared weeds and alien invader plants are regarded to be similar to that within the original Ecology Report. As such a re-assessment of this impact is not deemed necessary. The recommendations within the Ecological Walk-Through Report (October 2015) as well as the Invasive Plant Management Plan (September 2015) are still applicable and should be implemented as requested.

2.1. Re-assessment of relevant impacts and comparison with previous assessment

Impact Nature: Impacts on individuals of threatened animal species.				
	Authorised		Proposed amendment	
	Without	With Mitigation	Without	With Mitigation

	Mitigation		Mitigation	
Extent	Regional (3)	Regional (3)	Regional (3)	Local (2)
Duration	Permanent (5)	Permanent (5)	Permanent (5)	Long Term (4)
Magnitude	Low (4)	Low (4)	Moderate (6)	Low (4)
Probability	Very Improbable (1)	Very Improbable (1)	Probable (3)	Improbable (2)
Significance	Low (12)	Low (12)	Medium (42)	Low (20)
Status	Negative	Negative	Negative	Slightly Negative
Reversibility	Not reversible	Not reversible	Not reversible	Limited reversibility
Irreplaceable loss of resources	Yes	Yes	Yes	No
Can impacts be mitigated?	Not required		Yes	
Mitigation	» None		<p>» <u>All management and mitigation measures recommended within the existing Search and Rescue and Rehabilitation Management Plan pertaining to faunal species should be executed.</u></p> <p>» <u>Tortoises and girdled lizards are especially prone to illegal collection and the appointed environmental control officer (ECO) / environmental officer (EO) as well as site managers should be aware of this potential threat and monitor all personnel moving in and out of the development area. No collection of tortoises and girdled lizards may be allowed.</u></p> <p>» <u>The habitat of the Karoo Girdled Lizard population should be left undisturbed as far as possible. The only disturbance that can be allowed is within the construction footprint areas.</u></p> <p>» <u>These areas should be thoroughly inspected and any potential species should be relocated to the rocky areas, still located within</u></p>	

		<u>their habitat range but outside of the development area, by an appropriate person (ECO or EO).</u> » <u>All turbine sites should also be thoroughly investigated for any baboon spider burrows.</u> » <u>Active nests should be identified (nests still lined with fresh silky webs) and all spider species located within the development footprint area should be carefully dug up under the supervision of the ECO/EO (burrows normally 60 – 70cm deep) and the individuals be translocated. This should be undertaken by a suitably qualified person.</u>
Cumulative Impacts	Impacts that cause loss of habitat (e.g. soil erosion, alien invasions) may exacerbate this impact.	Impacts that cause loss of habitat (e.g. soil erosion, alien invasions) may exacerbate this impact.
Residual Impacts	Likely to be residual impacts only if the impact actually occurs, which is considered unlikely.	Residual impact are likely to low if mitigation measures are implemented.

Impact Nature: Loss of habitat within indigenous natural vegetation types.				
	Authorised		Proposed amendment	
	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation
Extent	Local (1)	Local (1)	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (3)	Low (4)	Minor (3)
Probability	Definite (5)	Definite (5)	Highly Probable (3)	Improbable (2)
Significance	Medium (50)	Medium (45)	Medium (30)	Low (18)
Status	Negative	Negative	Negative	Negative
Reversibility	Not reversible	Not reversible	Not reversible	Limited reversibility
Irreplaceable loss of resources	Yes	Yes	Yes	No
Can impacts be mitigated?	No		To an extent	

Mitigation	<ul style="list-style-type: none"> » Avoid unnecessary impacts on natural vegetation surrounding the turbines. The construction impacts must be contained to the footprint of the turbine and laydown area. » Disturbed areas must be rehabilitated as quickly as possible 	<ul style="list-style-type: none"> » <u>Special emphasis should be placed on the monitoring and management/mitigation of potential erosion as recommended within the above Rehabilitation management plan.</u>
Cumulative Impacts	Soil erosion, alien invasions, damage to wetlands may all lead to additional loss of habitat that will exacerbate this impact.	Soil erosion, alien invasions, damage to wetlands may all lead to additional loss of habitat that will exacerbate this impact.
Residual Impacts	Some loss of natural vegetation type is likely to occur, but only a small extent is potentially at risk.	Some permanent loss of vegetation is likely but large areas that were disturbed during the construction phase can be rehabilitated and re-vegetated to an extent.

3. ADDITIONAL IMPACTS THAT WERE IDENTIFIED

It is important to take note that this additional impact described below is not a direct result of the proposed amendment but rather as a result of the development in combination with the other proposed developments within the same vegetation type. Even though this project was the first approved and awarded preferred bidder in the area and at the time of the initial assessment had no contribution to such an impact, the current situation, at the time of this assessment, of an increase in potential WEFs cannot be ignored and as such have been assessed below. The proposed amendment has furthermore, not resulted in any increase in this impact but rather has resulted in a slight decrease in significance as a result of a decrease in wind turbines.

3.1. Additional Impact 1: Cumulative Impact on the vegetation type due similar developments.

Due to the relative small extent of the Central Mountain Shale Renosterveld (1 236km²) and the numerous proposed renewable energy projects in the area (according to DEA-registered projects), most notable the Inca Komsberg and Kareebosch projects, which is mostly concentrated along the escarpments impacts within escarpment associated vegetation types (Central Mountain Shale Renosterveld and Roggeveld Shale Renosterveld) will be more profound. Cumulative impacts on especially the Central Mountains Shale Renosterveld appear to be of concern due to its limited distribution and the fact that a significant portion, especially in the west is within renewable energy development application areas. This cumulative impact on the relevant vegetation type were not assessed during the initial ecological assessment and due to the above mentioned aspect it is deemed an important impact to be assessed.

Such cumulative impacts may lead to:

- The loss of vegetation types on a cumulative basis from the broad area may impact the countries' ability to meet its conservation targets.
- Transformation of intact, sensitive habitats could compromise the ecological functioning of these habitats and may 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.
- The loss of biodiversity may be exacerbated.
- Invasion of exotics and invasive species into the broader area may also potentially be exacerbated.
- Ultimately the status of this vegetation type may change and be potentially listed within the National List of Threatened Ecosystems (NEM:BA)

Impact Nature: Cumulative loss or fragmentation of a vegetation type (Central Mountains Shale Renosterveld) with a relative limited distribution when all renewable projects are within this vegetation type is considered.		
	Without Mitigation	With Mitigation
Extent	Regional (4)	Regional (3)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (7)	Low (5)
Probability	Highly Probable (4)	Probable (3)
Significance	High (64)	Medium (39)
Status	Negative	Neutral
Reversibility	Low	Slight local potential
Irreplaceable loss of resources	Yes	No
Can impacts be mitigated?	Yes,	
Mitigation	» The development footprint should be kept to a minimum and natural vegetation should be encouraged to return to disturbed areas. » An open space management plan should be developed for the site, which should include management of biodiversity within the fenced area, as well as that in the adjacent rangeland. » Reduce the footprint of the facility within sensitive habitat types as much as possible. » All management and mitigation measures recommended within the Search and Rescue and Rehabilitation Plan as well as within the Invasive Alien Plant Management Plan should be enforced.	

4. CONCLUSION AND RECOMMENDATIONS

The amendments proposed by Karusa Wind Farm (Pty) Ltd included;

- Rotor diameter: From 120m to 150m
- Generating capacity per turbine: From 2 - 3.5MW to up to 4.5MW
- Amount of Turbines: Reduced from 57 turbines to 43 turbines
- Location of Turbines: Slight adjustment to the location of turbines and associated infrastructure.

In order to obtain accurate results and to provide an applicable and relevant comparison and description of the potential impacts associated with the development a site visit was conducted between 18 and 20 September 2017. During the site visit it was determined that:

- The development will occur within the Central Mountain Shale Renosterveld
- This vegetation type is classified as Least Threatened by Mucina and Rutherford (2006) and is not listed within the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) as a threatened ecosystem.
- The amended activities will almost solely occur within a singular habitat type namely the *Rosenia genistifolia* – *Ruschia cradockensis* Shrubby Escarpment/Plateau.
- Most of the adjusted locations are selected within more gradual areas along the plateau which tend to be slightly overgrazed and trampled by sheep allowing *R. cradockensis* to become encroaching.
- By placing the wind turbines within these areas, the more sensitive and unique shrubby rocky patches (containing numerous protected succulents and geophytes) as well as the diverse south facing slopes is avoided, whilst most of the development will occur in a less sensitive habitat.
- Furthermore, these locations are less prone to severe erosion and the management of potential erosion is simpler in comparison to other areas.
- Flora:
 - The current proposed amendments is regarded to be slightly more positive in terms of the impacts on the vegetation of the escarpment as well as the protected species associated with this area as fewer wind turbines will be utilised thus lowering the total area that will be transformed. Furthermore, most of the new wind turbine locations are within less sensitive areas along the escarpment/plateau, avoiding most of the sensitive areas.
- Fauna
 - The current proposed amendments is regarded to be slightly more positive as fewer wind turbines will be utilised thus lowering the total available habitat for such species that will be transformed. Furthermore, most of the new wind turbine locations are within less sensitive areas along the escarpment/plateau,

avoided most of the sensitive areas such as the rocky patches (preferred habitat for species such as the Crossed Whip Snake, Southern Rock Agama and Karoo Girdled Lizard).

Following the survey and interpretation of results, the following conclusions were made regarding the potential impacts.

- Assessment of impacts listed within the original Ecological Report
 - Impacts on threatened animals: Due to the presence of protected species, being potentially vulnerable to such habitat disturbance, this impact was re-assessed and compared with the assessment from original report. Even though the significance of this impact is slightly higher, it can still be successfully mitigated, subsequently avoiding detrimental impacts on these populations and as such the new amended positions are regarded as acceptable. Furthermore, as fewer wind turbines will be utilised the total available habitat for such species that will be transformed will be lowered.

- Summary of Impact Comparison:

	Authorised		Proposed amendment	
	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation
Significance	Low (12)	Low (12)	Medium (42)	Low (20)

- Impacts on threatened plants: The aspects relating to the impacts (Extent, Duration, Magnitude, Probability and Significance) on such plants are regarded to be similar to that within the original Ecology Report. As such a re-assessment of this impact was not deemed necessary.
- Loss or fragmentation of indigenous natural vegetation: The aspects relating to the impacts (Extent, Duration, Magnitude, Probability and Significance) on indigenous natural vegetation are regarded to be largely similar to that within the original Ecology Report. However, due to a decrease in the amount of turbines, the total area being disturbed will subsequently decrease. This in turn will result in a decrease in the significance of this impact (fracturing and loss of natural vegetation) and as such this impact has been re-assessed and compared with the original assessment.

- Summary of Impact Comparison:

	Authorised		Proposed amendment	
	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation
Significance	Medium (50)	Medium (45)	Medium (30)	Low (18)

- Establishment and spread of declared weeds and alien invader plants: The aspects relating to the impacts (Extent, Duration, Magnitude, Probability and Significance) associated with the establishment and spread of declared weeds and

alien invader plants are regarded to be similar to that within the original Ecology Report. As such a re-assessment of this impact was not deemed necessary.

- Additional impacts deemed necessary for inclusion.

- Additional Impact 1: Soil erosion and associated degradation of ecosystems

	Without Mitigation	With Mitigation
Significance	Medium (52)	Low (12)

- Additional Impact 2: Cumulative Impact on the vegetation type due similar developments.

	Without Mitigation	With Mitigation
Significance	High (64)	Medium (39)

The following management and mitigation measures were recommended:

- All recommendations provided within the original Ecological Report (Specialist ecological study on the potential impacts of the proposed Hidden Valley Wind Energy Facility Project near Matjiesfontein, Northern Cape – 17 March 2012; Compiled by Dr. David Hoare) has relevance and should be implemented.
- All recommendations and mitigation measures provided within the following management plans have relevance and should be implemented:
 - Invasive Plant Management Plan: Karusa Wind Farm (Phase 1 of the Hidden Valley Wind Energy Facility) – September 2015; Compiled by Savannah Environmental (Pty) Ltd.
 - Plant Search and Rescue and Rehabilitation Management Plan: Karusa Wind Farm (Phase 1 of the Hidden Valley Wind Energy Facility) – September 2015; Compiled by Savannah Environmental (Pty) Ltd.
- Additional protected plant species to be included into the Plant Search and Rescue and Rehabilitation Management Plan as listed in the report in section 1.1
- Additional mitigation measures pertaining to faunal species as specified within section 1.1 should also be included into the EMPr and applicable Management Plans.
- Recommended mitigation measures pertaining to Cumulative loss or fragmentation of a vegetation type (Central Mountains Shale Renosterveld) with a relative limited distribution when all renewable projects are within this vegetation type is considered:
 - The development footprint should be kept to a minimum and natural vegetation should be encouraged to return to disturbed areas.
 - An open space management plan should be developed for the site, which should include management of biodiversity within the fenced area, as well as that in the adjacent rangeland.

- Reduce the footprint of the facility within sensitive habitat types as much as possible.

In conclusion the newly proposed amendments to the layout and the turbine specifications will have very similar ecological impact but due to the fact that a lower amount of turbines will be utilized, the cumulative size of this impact will be smaller and a smaller area will be transformed and disturbed. As such these proposed amendments are regarded as acceptable and may be approved as they will have a relatively positive or improved impact when compared to the current approval.



Gerhard Botha (SACNASP Reg. No 400502/14)

2017/10/23