

This chapter discusses the impact the proposed Roggeveld Wind Farm may have on flora and fauna associated predominantly with destruction, degradation or fragmentation of habitat. ERM appointed Simon Todd Consulting to undertake the required specialist study for the proposed development, which is appended to this report as *Annex E*. The potential impacts are assessed and mitigation measures to reduce the impacts are outlined below.

The footprint of the proposed wind farm includes turbine foundations, permanent and temporary laydown areas, road widening and ancillary infrastructure. The development would thus result in the direct loss of about 200 ha of currently intact vegetation with the footprint dispersed across the site, with turbines located predominantly on the ridges.

The majority (80 percent) of turbines are located within the Central Mountain Shale Renosterveld and about 20 percent within Koedoesberge-Moordenaars Karoo vegetation types. Although these vegetation types are not well protected within formal conservation areas, they have not been highly impacted by intensive agriculture and both Koedoesberge-Moordenaars Karoo and Central Mountain Shale Renosterveld remain largely intact.

An ecological sensitivity map of the site shows that a large proportion of the southern and central portion of the site is of high sensitivity. The high-lying or steep ridge sections within the northern section of the site emerge as having high sensitivity while the lowlands generally emerge as being of a lower sensitivity. The overall implications of the sensitivity map (see *Figure 7.1* below) includes that fact that the site is generally a sensitive environment that would be vulnerable to development and also that there appear to be few options with regards to finding alternative lower sensitivity placements for the turbines. The ridgelines are by their nature relatively flat, with the result that these areas are less sensitive than the adjacent slopes in terms of physical disturbance and associated erosion risk. However, the ridgelines themselves also represent a different edaphic habitat from the adjacent slopes, with the consequence that plant and animal communities on the ridgelines are often different from the adjacent slopes.

The major impact on flora and fauna associated with the development will occur during the construction phase of the project. The major impacts at this stage will be the loss of natural vegetation and transformation and disturbance of natural ecosystems at the site. The presence of a sizeable construction workforce at the site also poses several risks, as does the operation and presence of construction machinery. In general, the major impacts associated with the construction phase of the development can be summarized under the following areas of impact which are discussed and assessed in more detail below.

- Destruction and Loss of Vegetation;
- Direct Impact on Protected Plant Species;
- Direct Faunal Impact;
- Loss of Faunal Habitat; and
- Impacts on Critical Biodiversity Areas.

Maintenance activities in the operational phase may result in some damage to vegetation or disturbance to fauna present on site.

The type of potential impacts on flora and fauna are summarised in *Table 7.1*.

Table 7.1 *Impact Characteristics: Impacts on Flora and Fauna*

Summary	Construction	Operation
Project Aspect/ activity	(i) Loss of vegetation associated with site clearance, road construction, lay-down and assembly area etc. (ii) Disturbance caused by introduction of soil from elsewhere, and seeds on vehicles and equipment, resulting in invasion of alien species. (iii) Impact on fauna associated with site clearance, blasting, road upgrade and lay-down areas, and increased human activity.	(i) Damage to natural vegetation through off-road movement of vehicles and maintenance activities. (ii) Disturbance to fauna associated with the operation of the wind farm and movement of vehicles.
Impact Type	Direct	Direct
Receptors Affected	(i) Natural vegetation within the site clearance areas. (ii) Fauna on site including amphibians and reptiles.	(i) On-site vegetation (ii) Fauna on the wind farm site.

7.1 IMPACT ON FLORA

The major impact on flora associated with the development will occur during the construction phase of the project. The major impacts at this stage will be the loss of natural vegetation and transformation and disturbance of natural

ecosystems at the site. The presence of a sizeable construction workforce at the site also poses several risks, as does the operation and presence of construction machinery. In general, the major impacts associated with the construction phase of the development can be summarized under the following areas of impact which are discussed and assessed in more detail below.

- Destruction and loss of vegetation; and
- Impact on protected plant species.

The assessment of construction phase impacts below is followed by an assessment of the potential impact the proposed development may have on flora during the operational phase.

During the operational phase, human activity and disturbance levels at the site should be relatively low as compared to the construction phase. The impacts associated with this phase are likely to be related to maintenance activities and carry-over effects resulting from the construction phase. Potential impacts include the following and are assessed below:

- Alien plant invasion; and
- Illegal collecting of protected plant species.

7.1.1 *Destruction and Loss of Vegetation*

Construction Phase

The establishment of the wind farm will require the destruction of vegetation in the footprint of the facility which is anticipated to be up to 200ha.

Nature: The construction phase will require the construction of a large number of access roads as well as the clearing of vegetation for turbines, their service areas and for buildings and temporary construction areas. Apart from the direct loss of vegetation, this will also render the disturbed areas vulnerable to erosion.

Impact Magnitude – Medium-High

- Extent: **Local**, the extent of the impact will be limited to the development footprint and near surroundings. Erosion may however also affect adjacent and downstream areas. The footprint of the development in terms of direct habitat loss will be around 200 ha.
- Duration: The duration of the impact will be **long-term** as the majority of impact will remain until the project is decommissioned.
- Intensity: Given the total loss of vegetation within affected areas, the intensity is seen to be **Medium-High**.

Likelihood: As this infrastructure is required for the operation and construction of the facility, this impact will definitely occur.

Impact Significance: Moderate-Major (-ve)

Degree of Confidence: High. Based on the project description, this impact will definitely occur

Box 7.1 *Destruction and Loss of Vegetation*

Mitigation

Mitigation measures to be implemented during the construction phase include the following:

- Areas to be cleared should be clearly demarcated.
- Vegetation should only be cleared when and where absolutely necessary. If possible, vegetative cover should be left in place. It is preferable to mow the vegetation down to the required height than to use other more destructive clearing methods such as grading.
- Where construction vehicles must traverse the site, they must remain on demarcated roads. If vehicles must leave the road for construction purposes, they should utilize a single track and should not take multiple paths.
- Where construction does not require the clearing of the vegetation, for example for the temporary lay-down areas, then construction should occur without clearing the vegetation as far as possible. Alternatively, already transformed areas such as old croplands should be used for this purpose.
- If topsoil must be removed from an area during construction, it should be replaced or used as soon as possible elsewhere as it will contain seed of local species which will aid the natural recovery of the vegetation.
- Appropriate erosion control and water diversion structures should be constructed at the same time as the vegetation is cleared so that the loosened soil is not left vulnerable to erosion.

Residual Impact

Implementation of the mitigation would mean that the potential impact significance of the illegal collection of protected species would be reduced to moderate-minor (see *Table 7.52*).

Table 7.7.2 *Pre- and Post-Mitigation Significance: Destruction and Loss of Vegetation*

Phase	Significance (Pre-mitigation)	Residual Impact Significance
Operation	MODERATE-MAJOR (-VE)	MODERATE-MINOR (-VE)

7.1.2 *Loss of Protected Plant Species*

Construction Phase

The conservation status of vegetation types (Tanqua Wash Riviere, Koedoesberge-Moordenaars Karoo, Central Mountain Shale Renosterveld and Tanqua-Karoo) within the study area are classified as Least Threatened. However, on SIBIS, SANBI’s biodiversity information database, 35 listed

(Vulnerable, Endangered, Critical) plant species are known to occur within and immediately surrounding the site. Listed species observed during the site visit include *Brunsvigia josephinae* (Vulnerable), *Duvalia parviflora* (Vulnerable), *Romulea hallii* (Vulnerable) and *Adromischus mammillaris* (Endangered). The potential impact the proposed development may have on protected plant species is assessed below.

Box 7.2

Loss of Protected Plant Species

Nature: The construction phase will require the clearing of vegetation in areas which were observed to contain listed plant species. The local populations of these species will therefore be impacted unless mitigation measures are implemented.

Impact Magnitude - Medium

- **Extent:** Local to regional, the extent of the impact will be regional for highly threatened plant species as their population viability within the broader area may be affected.
- **Duration:** The duration of the impact will be long-term as the habitat will be unavailable to these species until the project is decommissioned.
- **Intensity:** Since this would result in the destruction of listed plant species within the affected areas, the intensity is seen to be High on particular species located within the development footprint.

Likelihood: Protected plant species were observed within the development footprint indicating that this impact is likely to occur.

Impact Significance: Moderate (-ve) unless mitigation measures are implemented.

Degree of Confidence: Definite, the listed species were observed to occur at the site and within areas that are within the development footprint.

Mitigation

The mitigation measures to minimise the impact of the development on protected plant species are outlined below.

- The turbine locations should be individually assessed for the presence of listed species and sites found to contain a high abundance of such species should be relocated to a suitable less sensitive adjacent area.
- Since a large proportion of the listed species at the site are geophytes or succulent species, the potential for successful translocation is high. Therefore, it is recommended that before construction commences individuals of listed species within the development footprint should be marked and translocated to similar habitat outside the development footprint under the supervision of an ecologist or someone with experience in plant translocation. Permits from the relevant provincial authorities will be required to relocate listed plant species.
- Any individuals of protected species observed within the development footprint during construction (ie. individuals that were missed during

pre-construction surveys), should be translocated under the supervision of the Environmental Control Officer (ECO), see also the Environmental Management Programme (EMP) in *Annex L*.

Residual Impact

Implementation of the construction phase mitigation would mean that the potential impact significance of the illegal collection of protected species would be reduced to moderate-minor (see *Table 7.53*).

Table 7.3 *Pre- and Post-Mitigation Significance: Loss of Protected Plant Species*

Phase	Significance (Pre-mitigation)	Residual Impact Significance
Operation	MODERATE (-VE)	MODERATE-MINOR (-VE)

7.1.3 *Alien Plant Invasion*

Operational Phase

The disturbance associated with the construction phase of the project will render the disturbed areas vulnerable to alien plant invasion. The site displayed low levels of impact by alien plants, however, this may change with the proposed development which would include the construction of roads in previously undisturbed areas. Some alien invasion is inevitable and regular alien clearing activities will be required to limit the extent of this problem. Once the natural vegetation has returned to the disturbed areas, the site will be less vulnerable to alien plant invasion, however, the roadsides and laydown areas adjacent to turbines are likely to remain foci of alien plant invasion.

Nature: The large amount of disturbed and bare ground that is likely to be present at the site after construction will leave the site vulnerable to alien plant invasion. The presence of alien plants may prevent the natural recovery of the natural vegetation, reduce plant and animal diversity at the site as well as result in various other negative ecosystem consequences. Furthermore, the Conservation of Agricultural Resources Act, (Act No. 43 of 1983) requires that listed alien species are controlled in accordance with the Act.

Impact Magnitude - Medium

- **Extent:** Local, the extent of the impact will be largely limited to disturbed areas of the site, but adjacent areas may also become affected if invasion is severe.
- **Duration:** Should alien plants become established this would be considered to have a long-term impact as these plants would probably persist at the site for years or decades and once a seed bank has established, alien plants may be difficult to eradicate.
- **Intensity:** The intensity of the impact is likely to be medium as the soils at the site are generally quite nutrient poor which would reduce the potential for alien plant invasion.

Likelihood: Since the development of the site will result in a fairly extensive disturbance, it is likely that some alien plant invasion will occur.

Impact Significance: Moderate (-ve)

Degree of Confidence: There is a high degree of confidence in the assessment of this risk.

Mitigation:

- Regular monitoring for alien plants at the site should occur.
- When alien plants are detected, these should be controlled and cleared using the recommended control measures for each species to ensure that the problem is not exacerbated or does not re-occur.
- Clearing methods employed at the site should themselves aim to keep disturbance to a minimum (ie avoid clearing of vegetation through grading).

Residual Impact

Implementation of the mitigation would mean that the potential impact significance of the alien plant invasion would be reduced to minor (see Table 7.54).

Table 7.4 *Pre- and Post-Mitigation Significance: Alien Plant Invasion*

Phase	Significance (Pre-mitigation)	Residual Impact Significance
Operation	MODERATE (-VE)	MINOR (-VE)

7.1.4

Illegal Collecting of Flora

Operational Phase

Some protected plant species such as *Gasteria* and *Haworthia spp* are sought after by plant collectors and for use in traditional medicine and the road network during the operational phase of the project would potentially increase the accessibility of the site and leave these species' vulnerable to illegal collection.

Box 7.3

Impacts on flora due to illegal collecting

Nature: The development will result in the construction of a large number of roads into previously inaccessible areas. This will increase the risk of illegal collection of plants for trade or other purposes. Vulnerable species include various succulent and geophyte species which are sought-after among collectors.

Impact Magnitude - Medium

- **Extent:** Local, the extent of the impact will be limited to the site.
- **Duration:** The duration of the impact will be long-term as the roads will remain in place for the foreseeable future.
- **Intensity:** As this impact will be concentrated on a few targeted species, the impact on these species could be of high intensity.

Likelihood: There is a high probability that this would occur if appropriate mitigation measures are in place.

Impact Significance: Moderate (-ve)

Degree of Confidence: Moderate. This impact can be assessed with a moderate degree of certainty.

Mitigation

The mitigation measures required to mitigate the illegal collection of protected species revolves around education of employees and site access control.

- Access to the turbine roads should be strictly controlled and access to the area in general should be regulated.
- Staff present during the operational phase should receive environmental education so as to ensure that no harvesting of plants occurs.
- The collection or harvesting of any plants at the site should be strictly forbidden.

Residual Impact

Implementation of the operational phase mitigation would mean that the potential impact significance of the illegal collection of protected species would be reduced to minor (see *Table 7.5*).

Table 7.5 *Pre- and Post-Mitigation Significance: Illegal Collecting of Flora*

Phase	Significance (Pre-mitigation)	Residual Impact Significance
Operation	MODERATE (-VE)	MINOR (-VE)

7.1.5 *Monitoring requirements for flora*

The sensitive environments at the site require specific attention to avoid and mitigate negative impacts to these areas. Sensitive areas include rare edaphic environments as well as drainage lines, seeps and wetlands. These areas would be particularly vulnerable to negative impact during the construction phase when the major infrastructure associated with the development is laid down. Monitoring of these aspects should be carried out by a botanist during pre-construction and by the ECO during construction (if suitably qualified) or a botanist.

Pre-construction monitoring

Pre-construction monitoring by a botanist should occur to identify listed species within areas that will be impacted by the development. The following recommendations are made in this regard:

- Species such as geophytes and succulents which are likely to be good candidates for translocation, should be marked so that they can be relocated to an adjacent similar environment at the appropriate time, which would be during the winter or spring for most species except geophytes which would be better translocated during the late summer;
- Number and identities of all species translocated should be recorded; and
- Relocated individuals should be marked and monitored for at least a year after transplanting to establish the success rate of the relocation exercise.

Construction monitoring

- Before roads are constructed, their proposed routes should be inspected on foot and all wetlands and riparian areas mapped and recorded on a GPS. Where planned roads traverse wetlands, these should be rerouted so as to avoid the wetlands. The services of an ecologist trained in the field may be required to accurately identify and delineate the wetlands.
- Where roads traverse rivers and drainage lines, the sites should be monitored to ensure that the presence of the road is not resulting in erosion or the deposition of large amounts of silt.
- The state of vulnerable wetlands near to roads should be recorded, preferably during the late wet season. A repeat photography method is suggested as a simple yet cost effective manner for monitoring wetland state. It is important to note that near and close-up pictures would be required to adequately assess changes in wetland state.

Habitat loss and fragmentation is primarily a concern during the construction phase since this is when the majority of disturbance will take place. Specific areas that should be monitored include:

- Any deviations from the final construction plan, including the location, extent and nature of vegetation impact and transformation;
- The location and extent of temporary lay-down areas, these should be included in the sweeps for alien species; and
- Any inadvertent or otherwise unintended destruction of natural vegetation and the remediation steps taken to encourage the recovery of the impacted areas.

Operational phase monitoring

The large amount of disturbance that would occur at the site is likely to render it highly vulnerable to alien plant invasion, particularly in the first few years post-construction and especially if soil or rock material from outside the project area is introduced which may contain seeds of alien species or weeds. The roads and disturbed areas around the turbines are likely to be the major invasion foci. Monitoring for aliens should be undertaken by a botanist and should include the following measures:

- In a similar manner to erosion, an alien monitoring system should be set up which allows for the occurrence, persistence and treatment of alien plants to be monitored in a manner which allows the data to be documented and interrogated in a GIS;
- Monitoring for alien plants could be done simultaneously with erosion monitoring and at a similar interval;
- The system should record the species present, their location, the control measures used and their success rate; and
- During the operational phase, it is recommended that a fire monitoring system is set in place to record the date, extent and source of all fires at the site. Fire is a key ecological driver in fynbos vegetation and the extent to which the development impacts the fire regime at the site should be established so as to better inform long-term fire management at the site.

7.2

IMPACT ON FAUNA

The development of the site would directly impact the fauna of the site in several different ways. Firstly, there would be a large amount of noise and disturbance associated with the construction phase. This would frighten many of the larger mammals away from the area and would probably cause increased mortality among these individuals as they would have to move into sub-optimal habitat or compete with other individuals for new territories. This effect would be transient and affected species would be able to return once construction has been completed. However, the presence of the turbines may deter sensitive species from returning or would require some time for them to become habituated to their presence. Secondly, the transformation of intact vegetation would constitute habitat loss and fragmentation for fauna.

Given the limited extent of transformation of the site and the limited land requirement of the development relative to the extent of available intact habitat, the direct loss of habitat would be minimal for most faunal species and there do not appear to be any species which would be significantly impacted by the direct loss of habitat. Fragmentation poses a greater threat as some species may avoid open areas or become vulnerable to predation while traversing open ground. The presence of a construction workforce would also increase the risk of poaching during the construction phase of the project. Smaller antelope such as Klipspringer, Duiker and Steenbok would probably be the most vulnerable. As with listed plant species, the illegal collection of tortoises and other reptiles for food, pets or trade would be an increased risk associated with the development. Attractive species such as the Tent Tortoise would be particularly at risk. The large amount of machinery and construction material present at the site during the construction phase would pose a pollution risk that could negatively affect local amphibian populations should any spills occur. Traffic at the site during all phases of the project would pose a risk of collisions with fauna. Slower groups such as tortoises, snakes and amphibians would be most susceptible and the impact would be largely concentrated to the construction phase when vehicle activity was high.

The major impact associated with the development will occur during the construction phase of the project. The major impacts at this stage will be the loss of natural vegetation and transformation and disturbance of natural ecosystems at the site. The presence of a sizeable construction workforce at the site also poses several risks, as does the operation and presence of construction machinery. In general, the major impacts associated with the construction phase of the development can be summarized under the following areas of impact which are discussed and assessed in more detail below.

- Destruction and Loss of Vegetation;
- Direct Impact On Protected Plant Species;
- Direct Faunal Impact;
- Loss of Faunal Habitat; and
- Impacts On Critical Biodiversity Areas.

Nature: The construction phase will result in a lot of physical disturbance at the site as well as habitat destruction for resident faunal species. This will result in direct mortality for smaller fauna unable to move away from the construction activities and a loss of faunal habitat in general. The human activity and noise generated by the construction will also frighten most medium and larger fauna away from the construction area.

Impact Magnitude - Moderate

- **Extent:** Local, the extent of the impact will be limited to the site and near surroundings.
- **Duration:** The duration of the impact will be short term or as long as construction is underway. The impact with regards to habitat loss is considered part of the operational phase.
- **Intensity:** The large amount of activity at the site and the associated disturbance resulting from clearing and construction will constitute a Moderate disturbance intensity.

Likelihood: There is a very high likelihood that this impact will occur in and around construction areas.

Impact Significance: Moderate (-ve)

Degree of Confidence: Definite. Based on the project description, this impact will occur.

Mitigation:

- Any slow-moving fauna, such as tortoises or snakes observed at the site during the construction phase should be removed to safety by the ECO.
- In order to reduce collisions of vehicles with fauna, speed limits should apply to all roads and vehicles using the site, a maximum of 40 km/h is recommended. Animals should have right of way.
- All cleared areas which do not need to remain clear of vegetation should be rehabilitated or seeded with local species if natural recovery does not take place within a year of being cleared.

Nature: A significant number of construction workers will be on site during the construction phase posing a risk to fauna as a result of poaching and hunting of fauna for food or other purpose. Vulnerable species would include Tent Tortoises *Psammobates* spp. as well as mammals such as Klipspringer, Steenbok, Duiker and hares (*Lepus* spp).

Impact Magnitude - Moderate

- **Extent:** Local, the extent of the impact will be limited to the site and near surroundings.
- **Duration:** The duration of the impact will be short-term or as long as construction is underway.
- **Intensity:** As this impact will be concentrated on a few targeted species, the impact on these species could be of high intensity.

Likelihood: There is a high probability that this would occur if appropriate mitigation measures are not taken.

Impact Significance: Moderate (-ve)

Degree of Confidence: High. This impact can be assessed with a moderate degree of certainty.

Mitigation:

- The staff accommodation should be fenced off and no personnel should be allowed to wander around at the site for any purpose after hours.
- The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden.
- Fires should only be allowed within fire-safe demarcated areas.
- No fuelwood collection should be allowed on-site.
- No dogs should be allowed on site.
- As part of the EMP for the site, it should be mandatory for staff of both the developer as well as contractors to attend an environmental briefing and training session with respect to the guidelines outlined in this document and the EMP.

Other general mitigation measures recommended for the site during the construction phase include:

- 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.
- The large number of people on site during the construction phase will require that an on-site ablution, sanitation, litter and waste management program is implemented.

Nature: The development will result in the construction of a large amount of roads into previously inaccessible areas. This will increase the risk to fauna as a result of poaching and illegal collection of animals for trade or other purposes. Vulnerable species would include Tent Tortoises *Psammobates spp.* which are sought-after among collectors.

Impact Magnitude - Moderate

- **Extent:** Local, the extent of the impact will be limited to the site.
- **Duration:** The duration of the impact will be long-term as the roads will remain in place for the foreseeable future.
- **Intensity:** As this impact will be concentrated on a few targeted species, the impact on these species could be of high intensity.

Likelihood: There is a high probability that this would occur if appropriate mitigation measures are not taken.

Impact Significance: Moderate (-ve)

Degree of Confidence: Moderate. This impact can be assessed with a moderate degree of certainty.

Mitigation:

- Access to the turbine roads should be strictly controlled and access to the area in general should be regulated.
- Staff present during the operational phase should receive environmental education so as to ensure that that no hunting or harvesting of animals occurs.
- The collection, hunting or harvesting of animals at the site should be strictly forbidden.

Nature: Certain animals may avoid or be frightened away by the turbines. This would reduce the connectivity of the landscape as the turbines would form a barrier to movement for these species.

Impact Magnitude – Low

- **Extent:** Local, the extent of the impact will be limited to the site and surroundings.
- **Duration:** The duration of the impact will be long-term as the effect would persist as long as the turbines were present.
- **Intensity:** Since the turbines are not continuously distributed there would be gaps available for movement and most species would probably also become habituated to the presence of the turbines, the effect is deemed to have a low intensity.

Likelihood: The effect is likely to occur at least to some extent for certain species.

Impact Significance: Minor (-ve). The number of species affected is likely to be low and is likely to include the more mobile species present which would in any case probably be able to find the gaps in the turbine strings.

Degree of Confidence: This effect can be assessed with a moderate to low degree of confidence as little is known about how the local fauna is likely to respond to the presence of the turbines.

Mitigation:

- Apart from leaving gaps in the turbine strings, there is little that can be done to reduce this potential impact.

7.2.2

Monitoring Requirements for Fauna

Monitoring during the construction phase should be undertaken by the ECO and should ensure that human-animal interactions are kept to a minimum.

- Traffic on the access and service roads poses a significant risk to many animals, particularly during the construction phase when traffic volumes on the roads are likely to be heavy. Any fauna accidentally killed should be reported and a log of such mortalities maintained. Where possible the species killed should be identified and recorded as well. Monitoring should be on an ad-hoc basis, as incidents occur;
- Activities of staff should be monitored to ensure that undesirable activities such as hunting, illegal collecting of plants, seeds or any other biological material does not occur. Any incidents or transgressions relating to these aspects should be logged, as well as the remedial steps taken to rectify the situation; and

- There should be no fires outside of the designated and demarcated areas. Monitoring of impacts on fauna during the operational phase can contribute to furthering the understanding of the impacts of wind farms on mammals and other fauna, and could be coordinated by a post-graduate student. Such monitoring should assess the extent to which animal populations are vulnerable to or can recover from the negative effects of wind farm developments. G7 is encouraged to liaise with research institutions to determine if they are willing to coordinate this monitoring.
- Post-construction surveys to ascertain the extent and nature of the impact on this species. Surveys should continue for two to three years post-construction to ascertain the extent to which the short-term impacts which are likely to occur persist in the longer-term as animals become habituated to the turbines. The surveys could be conducted seasonally as habitat preference of the animals may change depending on the season.
- As part of mitigation, monitoring studies on potentially vulnerable species or groups of species such as tortoises, by students or universities could be encouraged and funded. There is a general paucity of knowledge on the ecological impacts of renewable energy facilities in South Africa and better knowledge will enable improved understanding of the nature of impacts as well as improve mitigation strategies.

7.2.3 *Impacts on Critical Biodiversity Areas (CBAs)*

The site straddles the planning domain of two different Biodiversity Assessments. Those parts of the site within the Western Cape fall within the *Biodiversity Assessment of the Central Karoo District Municipality* (Skowno et al. 2009). While those parts of the site lie within the Northern Cape *Namakwa District Biodiversity Sector Plan* (Desment & Marsh 2008).

The following issues need to be taken into account when considering development within a CBA:

- Are there alternative areas within the site but outside of the CBA that could be developed?
- Does the project undermine the overall ecological functioning of the broad CBA area?
- Can mitigation measures reduce the impact of the development on ecological processes?

In terms of the first issue listed above, this is largely outside the scope of this study as the location of turbines is based largely on wind resource availability and areas outside of the CBA may not meet suitability criteria in this regard. However, from the figure, it is clear that moving or removing the turbines currently within the CBA would have a large effect on the scale or location of the development.

With regards to the second issue raised above, it is important to first recognize the context within which the CBA operates as well as ascertain why the particular area concerned has been classified as a CBA. Impacts on endemic and listed plant species are a concern as are activities which result in the large-scale loss of CBA area or compromise the connectivity of the landscape. Although the development comprises a small proportion of the site, the impact of the development is not spread equitably across all vegetation and habitat types. As the turbines are restricted to ridgelines within a certain elevation range, these areas will be disproportionately affected and species which are confined to these areas will be similarly disproportionately impacted. A number of species and in particular several geophytes species were observed to be restricted to such ridgelines. There are few areas that can perform the same function and which contain a similar set of species and the western portion of the site falls within an area identified by experts as being an important area of plant diversity and endemism.

With regards to the final issue of mitigating the impacts of the development, there are not very many options available under the Site Layout Alternative 1 although some adjustments have been made to arrive at Site Layout Alternative 2. This and additional mitigation measures including potential biodiversity offsets are discussed below.

Box 7.8

Impact on Critical Biodiversity Areas

Nature: Although the actual impacts on the terrestrial ecology of the site have been identified and assessed above, the nature and consequences of the development for the CBAs of the site require greater clarification. A large proportion of the site particularly the section within the Western Cape has been classified as CBAs. These areas have been identified as CBA based on their high biodiversity value and their irreplaceable nature or important ecological role these areas play. The development would potentially compromise the ecological functioning of the CBAs.

Impact Magnitude – Moderate-High

- **Extent:** Local, the extent of the impact will be largely limited to the site, but broader implications would occur if the ecological functioning or biodiversity value of CBAs were compromised.
- **Duration:** The impact would persist for the lifespan of the project and is thus considered long-term.
- **Intensity:** The intensity of the impact is likely to be moderate to severe.

Likelihood: This impact is highly likely to occur as a large proportion of the development lies within CBAs.

Impact Significance: Moderate to High (-ve)

Degree of Confidence: There is a high degree of confidence in the assessment of this risk.

Mitigation:

- Based on the indicative layout, moving the development outside the CBA areas does not appear to be a viable strategy. Reducing the number of turbines within the CBAs would to some extent reduce the impact of the development. However, since a similar extent of road network may be required, this aspect would not be mitigated, only those impacts directly related to the number of turbines.
- As previously discussed, a biodiversity offset may be the only viable approach to mitigating the impacts of the development within the CBAs. This would involve committing a proportion of the site to a formal conservation arrangement (stewardship or some other long-term commitment).

7.2.4 Residual Impact

Most of the impacts can be mitigated to minor significance except for the impacts on the CBAs which can be viewed as being the cumulative impact of all the different impacts that will occur as a result of the development as well as the impact that the development will have on the undisturbed nature of the area. The residual impact for all other impacts should be low once appropriate mitigation measures have been implemented.

Table 7.3 Pre- and Post-Mitigation Significance: Fauna

Phase	Impact	Significance Pre Mitigation	Significance Post Mitigation
	Hunting and Collecting of Fauna	MODERATE (-)	MINOR (-)
	Loss of landscape connectivity for fauna	MINOR (-)	MINOR (-)
	Impact on Critical Biodiversity Areas	MODERATE-HIGH (-)	MODERATE (-)

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