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SPECIALIST IMPACT ASSESSMENT FOR PROPOSED DASSIESFONTEIN/KLIPHEUWEL WIND ENERGY FACILITY NEAR CALEDON, WESTERN CAPE: VEGETATION COMPONENT

Prepared for: Savannah Environmental (Pty.) Ltd., Johannesburg

Client: BioTherm Energy (Pty) Ltd.

6 October 2010

EXECUTIVE SUMMARY

This botanical impact assessment was requested in order to help inform decisions regarding the establishment of a proposed private wind energy facility (WEF) on two sites in the Caledon area of the Overberg region (Western Cape). The study area consists of two distinct sections, referred to as the Dassiesfontein section (in the west; about 1170ha) and the Klipheuwel section (in the east; about 1750ha). Both sections lie south of the N2 highway, and west of Caledon.

No alternative infrastructure layouts were provided for assessment at this phase. The assessed layout, which takes into account issues raised at the scoping stage, includes 16 wind turbines (6 at Dassiesfontein and 10 at Klipheuwel, each of up to 2MW). An area of approximately 602 hectares is being considered within which the facility is to be constructed. The proposed WEF would also include two substations (one on each site), internal and external access roads, underground cabling, and a maintenance /control building. No additional power lines will be needed as the substations are very close to an existing Eskom power line which crosses the development sites.

The study area is within the Cape Lowlands Renosterveld Project study area, which identified the majority of natural vegetation in both sections of the WEF as core conservation areas (von Hase *et al* 2003). The Klipheuwel area was also included within the priorities for 20 year conservation action (von Hase *et al* 2003).

There are two natural vegetation types in the study area – Western Ruens Shale Renosterveld and Overberg Sandstone Fynbos. Both are nationally recognised as threatened, with the former being Critically Endangered in terms of the National Spatial Biodiversity Assessment (Rouget et al 2004) and the Draft National List of Threatened Ecosystems (DEA 2009), whilst the latter is regarded as Critically Endangered in terms of the Draft National List of Threatened Ecosystems (DEA 2009). Thus all remaining natural vegetation in the study area is of High sensitivity and conservation value. Natural vegetation covers an estimated 50% of the Dassiesfontein section, and about 15% of the Klipheuwel section. The very high percentage of natural vegetation on the Dassiesfontein section is due to the unusually hilly topography and the central sandstone ridge (relatively infertile, rocky soils).

The vegetation in the study area ranges in condition from totally transformed agricultural land (about 70% of the area) to pristine. All the intact natural areas, and especially the Renosterveld areas, can be expected to support varying and significant numbers of threatened or localised plant species, and at least six Species of Conservation Concern are known to occur in the study area, including one (*Agathosma* sp. nov.) which is known only from the Dassiesfontein ridge, within 300m of the recently erected 80m wind monitoring mast.

Disturbance in the area includes cultivation (mainly for cereals and grazing for sheep), heavy grazing and trampling by cattle and sheep, and alien vegetation invasion. The most heavily disturbed areas are those that have been regularly ploughed and sown with crops, and these areas generally have no botanical value. Alien invasive vegetation is most severe in places on the Dassiesfontein ridge, along watercourses, and in places near homesteads.

Development within High sensitivity areas (*i.e*. any areas of natural vegetation) is not recommended, as it will result in permanent loss of Critically Endangered vegetation and possibly also of associated Species of Conservation Concern, and the impacts cannot be effectively mitigated.

The following potentially positive ecological impact has been identified:

- Opportunity to formally conserve and manage significant priority areas of natural habitat on site (basically an on-site conservation contribution), preferably as Contract Reserves with CapeNature's Stewardship Program.

The primary negative impacts are largely the result of direct factors. Direct impacts include loss of Critically Endangered natural vegetation (<1ha) in development footprints, and direct, long term loss of natural vegetation (<1ha) in areas that will be disturbed by heavy construction machinery, cable trench and power line installation, temporary dumping of building material, etc.

All impacts on High sensitivity vegetation can be avoided by minor changes to the layout, with the exception of the proposed access road and cable trench between turbines 2 and 3 at the Klipheuwel site, which will impact on a strip of about 275m of Critically Endangered vegetation (<0.2ha).

Indirect impacts are often difficult to quantify and avoid. The indirect botanical impacts of the proposed development are fortunately likely to be negligible in

relation to the existing and ongoing agricultural impacts on the site (*e.g*. agricultural expansion; alien vegetation invasion; grazing; fertiliser and pesticide usage and drift).

Cumulative effects are in many respects regional effects, and the impacts of this type of development will be significantly less than for various existing and ongoing agricultural operations in the region, as well as for the many unmanaged and expanding alien plant invasions on numerous properties in the region (including those on site).

If >98% of the development footprint can be restricted to areas of Low botanical sensitivity (as will be the case after proposed mitigation) the direct impact on natural vegetation will be minimised and overall botanical impact will be acceptable.

The proposed Klipheuwel substation is in an acceptable position, but the proposed Dassiesfontein substation will have significant negative impacts on the vegetation in this area, and should thus be moved (175m to the northwest, or alternatively immediately southwest of turbine 4) into a nearby area of agricultural land. This also presumably means that a number of proposed cable trenches will have to be rerouted, and in all cases these can easily be located within agricultural land, where they will have minimal botanical impact.

The preferred position for the access road and cable trench connecting turbines 5, 6 and 7 on the Klipheuwel site is indicated in Figure 2 of this report by the light green line. The original routing, as indicated by the pale blue line, should not be considered further.

The possible positive direct impact depends to a large degree on the management of the remaining High Sensitivity natural vegetation within the study area as a conservation area (Ruens Shale Renosterveld is very under-conserved, with less than 1% conserved), and the removal of livestock from the Renosterveld areas during the main flowering season (May – September). A minor, indirect positive impact is obviously the small contribution that this WEF will make to reducing CO_2 emissions, and the associated very small reduction in global warming effects.

Overall the proposed WEF is likely to have a Medium to High negative impact on the vegetation on site, prior to mitigation. This could be easily reduced to Low

negative with minor layout alteration, most notably the repositioning of the Dassiesfontein substation into an area of Low botanical sensitivity, and the rerouting of an access road at the Klipheuwel site.

It may be possible to achieve a Low or even a Medium positive overall impact after mitigation, but this would depend on the above mitigation being implemented, plus management (especially alien vegetation management) and formal conservation of most of the High sensitivity vegetation areas on site under CapeNature's Stewardship program. As this would require negotiation between the landowners, the applicant and CapeNature it is not known whether this is likely to happen, but it remains a recommendation.

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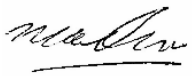
DECLARATION OF INDEPENDENCE

In terms of Chapter 5 of the National Environmental Management Act of 1998 specialists involved in Impact Assessment processes must declare their independence and include an abbreviated Curriculum Vitae.

I, N.A. Helme, do hereby declare that I am financially and otherwise independent of the client and their consultants, and that all opinions expressed in this document are substantially my own.



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Since 1997 I have been based in Cape Town, and have been working as a specialist botanical consultant, specialising in the diverse flora of the south-western Cape. Since the end of 2001 I have been the Sole Proprietor of Nick Helme Botanical Surveys.

A selection of recent, relevant projects undertaken include:

- Scoping study of Proposed Wind Energy Facility near Swellendam (CSIR 2010)
- Scoping and Impact Assessment of proposed West Coast One Wind Energy Facility near Vredenburg (Savannah Environmental 2010)
- Scoping and Impact Assessment of proposed Rheboksfontein Wind Energy Facility near Darling (Savannah Environmental 2010)
- Scoping study of proposed Wind Energy Facility near Britannia Bay (Savannah Environmental 2010)
- Scoping study of Proposed Wind Energy Facility near Bredasdorp (CSIR 2010)
- Impact Assessment of proposed Blue Crane Signature Golf Estate, Caledon (Doug Jeffery Environmental Consultants 2010)
- Basic Assessment of proposed development of portion of Erf 1 (Extension 12), Caledon (EnviroDinamik; 2010)
- Scoping study of Proposed Wind Energy Facility near Caledon (Arcus Gibb 2009)
- Scoping and Impact Assessment of proposed Wind Energy Facility near Hopefield (Savannah Environmental 2008 & 2009)
- Scoping study of Proposed Wind Energy Facility near Vredendal (DJ Environmental 2009)
- Scoping study of Proposed Wind Energy Facility west of Bitterfontein (DJ Environmental 2009)

1. INTRODUCTION

This botanical impact assessment was requested in order to help inform decisions regarding the establishment of a proposed private wind energy facility (WEF) on two sites in the Caledon area of the Overberg region (Western Cape). The study area consists of two distinct sections, referred to as the Dassiesfontein section (in the west; about 1170ha) and the Klipheuwel section (in the east; about 1750ha). Both sections (or sites) lie south of the N2 highway, and west of Caledon.

No alternative infrastructure layouts were provided for assessment at this phase. The assessed layout includes 16 wind turbines (6 at Dassiesfontein and 10 at Klipheuwel, each of up to 2MW). An area of approximately 602 hectares is being considered within which the facility is to be constructed. The proposed WEF would also include two substations (one on each site), internal and external access roads, underground cabling, and a maintenance /control building. No additional transmission lines will be needed as the substations are very close to an existing Eskom transmission line.

The botanical Scoping study for this project was completed in March 2010 (Helme 2010).

2. LIMITATIONS AND ASSUMPTIONS

The baseline information about the vegetation of this site is contained in Helme (2010) and is not comprehensively repeated in this Impact Assessment report. No fieldwork was specifically undertaken for this study (although portions were visited on 24 September 2010), the primary reason being that all areas of natural vegetation in this area are considered to be no go areas for development (see below), and aerial image mapping was considered to be sufficiently accurate. The author is familiar with large parts of the study area, and was able to confidently interpret the Nov 2 2009 Google Earth imagery for this area, which was used as a basis for the sensitivity mapping in Helme (2010). The author has previously studied and sampled the vegetation in various localities within the study area, mostly as part of the fieldwork undertaken for the Cape Lowlands Renosterveld Project (Von Hase *et al* 2003). Given that all natural vegetation in the study area is classified as Critically Endangered on a national basis (DEA 2009 and Rouget et al 2004) it was assumed that all remaining areas of natural vegetation on site are of High botanical sensitivity and conservation value. Conservation value and sensitivity of habitats are a product of diversity, rarity of habitat, rarity of species, ecological viability and connectivity, vulnerability to impacts, and

reversibility of threats. The confidence level in the botanical sensitivity mapping is regarded as high. A site visit at the Impact Assessment stage is unlikely to have significantly increased the accuracy of the initial findings of Helme 2010.

It is assumed that the layout provided by BioTherm Energy is 95% spatially accurate, although it is clear that certain infrastructure is not optimally situated from a botanical point of view, and the identification of such is one of the primary aims of this report.

It is assumed that wind turbine foundations will permanently disturb an area of up to 20m by 20m; that permanent gravelled roads will be 6m wide; that adjacent laydown areas will temporarily disturb areas of up to 40m by 40m (or 20m by 70m), and possibly permanently disturb areas of up to 20m by 20m; and that the compacted area (long term to permanent disturbance) for crane travel will be up to 13m wide and parallel to and inclusive of the 6m wide gravelled roads (and thus 3m either side of the gravel roads). Disturbance corridors for underground cabling are estimated at up to 6m wide (3m for the trench and digger track, 3m for the temporary placement of soil). As no specific cable trench layouts were provided it is assumed that they will be routed within the proposed internal access road network, or within 6m of these roads. It is assumed that the two proposed substations will be constructed on site, and that the total footprint for each will be less than 0.7ha. The location of the maintenance /control building was not provided for assessment.

It is assumed that road gravel, if needed (deemed unlikely, as soils on site are naturally gravelly), will come from existing, authorised borrow pits off-site.

Figure 1: Proposed infrastructure layout for the Dassiesfontein section of the project. Black lines are internal access roads and are assumed to include the cable trenches, and white squares are the six turbine positions. The black rectangle towards bottom centre is the assessed substation position.

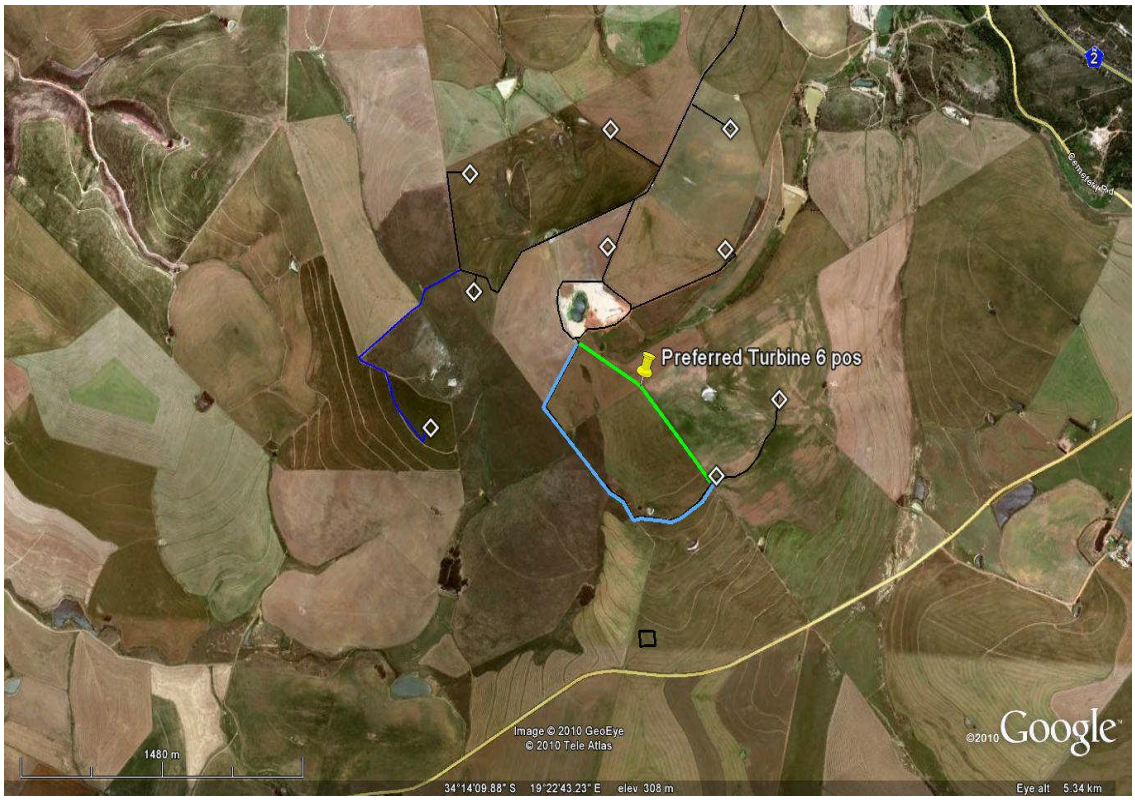

Figure 2: Proposed infrastructure layout for the Klipheuwel section of the project. Black and dark blue lines are internal access roads and are assumed to include the cable trenches, and white squares (plus one yellow placemark) are the ten turbine positions. The black rectangle towards bottom centre is the assessed substation position. The green line is the preferred alignment for the access road and cabling to turbine 6, and the light blue line is the old alignment that should not be used, as it crosses a High sensitivity area.

3. TERMS OF REFERENCE

Terms of reference (TOR) for the Scoping and IA phases were the standard TOR as proposed by CapeNature, and DEA&DP's guidelines for biodiversity assessment (Brownlie 2005) were also adhered to. The CapeNature TOR are as follows:

- Produce a baseline analysis of the botanical attributes of the property as a whole (see Helme 2010).
- This report should clearly indicate any constraints that would need to be taken into account in considering the development proposals further (see Helme 2010).
- The baseline report must include a map of the identified sensitive areas as well as indications of important constraints on the property. It must also (see Helme 2010 for most of below information):

- Describe the broad ecological characteristics of the site and its surrounds in terms of any mapped spatial components of ecological processes and/or patchiness, patch size, relative isolation of patches, connectivity, corridors, disturbance regimes, ecotones, buffering, viability, etc.
- In terms of biodiversity pattern, identify or describe:

Community and ecosystem level

a. The main vegetation type, its aerial extent and interaction with neighbouring types, soils or topography;
b. The types of plant communities that occur in the vicinity of the site
c. Threatened or vulnerable ecosystems (*cf. SA vegetation map/National Spatial Biodiversity Assessment, etc.)*

Species level

d. The presence of any plant Species of Conservation Concern (SCC)
e. The viability of and estimated population size of the plant SCC present (include the degree of confidence in prediction based on availability of information and specialist knowledge, i.e. High=70-100% confident, Medium 40-70% confident, low 0-40% confident)
f. The likelihood of other SCC occurring in the vicinity (include degree of confidence).

Other pattern issues

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

In terms of **biodiversity process**, identify or describe:

j. The key ecological "drivers" of ecosystems on the site and in the vicinity, such as fire.
k. Any mapped spatial component of an ecological process that may occur at the site or in its vicinity (i.e. *corridors* such as watercourses, upland-lowland gradients, migration routes, coastal linkages or inland-trending dunes, and *vegetation boundaries* such

as edaphic interfaces, upland-lowland interfaces or biome boundaries)

l. Any possible changes in key processes, e.g. increased fire frequency or drainage/artificial recharge of aquatic systems.
m. Would the conservation of the site lead to greater viability of the adjacent ecosystem?

- Would the site potentially contribute to meeting regional conservation targets for both biodiversity pattern and ecological processes?
- Is this a potential candidate site for conservation stewardship?
- What is the significance of the potential impact of the proposed project – with and without mitigation – on biodiversity pattern and process at the site, landscape, and regional scales? Include comment on cumulative impacts.
- Provide a map, at suitable scale, of key conservation areas and corridors.
- Recommend actions that should be taken to prevent or mitigate impacts. Indicate how these should be scheduled to ensure long-term protection, management and restoration of affected ecosystems and biodiversity.
- Indicate limitations and assumptions, particularly in relation to seasonality.

4. METHODOLOGY

The study approach was partly informed by the guidelines prepared by Brownlie (2005), and also by the TOR. Vegetation types used are as defined in the SA vegetation map (Mucina & Rutherford 2006), and ecosystem status is as per the National Spatial Biodiversity Assessment (Rouget et al 2004) and the subsequent Draft National List of Threatened Ecosystems (DEA 2009). Red List status of plant species is according to Raimondo et al (2009).

For previous records of rare plants in the area I was able to access the GIS based information on the Cape Rares database (Spatial layer of rare and threatened plant localities managed by the Threatened Species Programme of SANBI (January 2007), plus collections and observations made by this author over the last twelve years.

Subsequent to the baseline report of Helme (2010) all areas of elevated botanical sensitivity (areas of natural vegetation) were mapped on the Nov 2009 Google Earth imagery and saved as .kmz files, and were then forwarded to the planning team, which has subsequently endeavoured to avoid most of these areas.

5. DESCRIPTION OF THE AFFECTED ENVIRONMENT

5.1 Regional context

The primary description and mapping of the vegetation in the area can be found within the scoping study (Helme 2010), and is not repeated here in full.

The study area lies within the Fynbos biome and the Cape Floristic Region (CFR). The CFR is one of only six floristic regions in the world, is the richest temperate flora in the world, and is the only one confined to a single country. It is also by far the smallest floristic region, occupying only 0.1% of the world's land surface, and supporting about 9000 plant species - almost half of all the plant species in South Africa. At least 70% of all the species in the Cape region do not occur elsewhere, and many have very small home ranges (these are known as narrow endemics). Most of the lowland habitats are under pressure from agriculture, urbanisation and alien plants, and thus many of the range restricted species are also under severe threat of extinction, as habitat is reduced to extremely small fragments. Data from the Red Data Book listing process recently undertaken for South Africa is that 67% of the threatened plant species in the country occur only in the Fynbos biome, and these total over 1800 species (Raimondo *et al* 2009). It should thus be clear that the south-western Cape is a major national and global conservation priority, and is quite unlike anywhere else in the country in terms of the number of threatened plant species. Developments in this area thus need to take this into account.

The study area is part of the greater Overberg bioregion (also known as the Ruens), which is a major grain producing area. Due to the high agricultural potential of the shale-derived soils the loss of natural vegetation to agriculture has been severe (>85% lost), and the bioregion has a very large number of threatened plant species (probably more than 300; Raimondo *et al* 2009).

The Cape Lowlands Renosterveld Project (Von Hase *et al* 2003) identified much of the natural vegetation in the study area as core areas for conservation, and included most of the Klipheuwel section of the proposed facility within the proposed 20 year vision of this project. This effectively means that within twenty years the conservation of the Renosterveld in this area will have been achieved. Up until now there have been few Stewardship contracts signed with landowners in the area (C. Martins - pers. comm), but there have been a few contracts signed with landowners just outside the study area, and these contracts effectively

formalise the conservation of the natural vegetation in these areas, and are associated with certain financial (tax related) incentives for the landowners.

The primary reasons for including the natural vegetation in this area as core areas were the ecological connectivity value of the area, linking the Babilonstoring to the Caledon Swartberg, the relatively large extent of remaining Renosterveld, and the known occurrence of various threatened plant species in the area (Von Hase *et al* 2003).

5.2 Ecological drivers

Soil type is the primary driver of vegetation type differences in this area, with the Sandstone Fynbos found on nutrient poor, sandstone-derived soils, and the Renosterveld on nutrient rich shale-derived soils.

Fire is a key ecosystem driver of both Renosterveld and Sandstone Fynbos (De Villiers 2005). It is essential that these vegetation types burn once every 12 to 25 years, as many of the species are adapted to regular fires and will only flower or germinate from seed after a fire. Fires at a frequency greater than this will dramatically reduce overall species diversity, and fires less often than once every 25 or 30 years will lead to gradual senescence of many species, and hence local extinctions.

An additional ecological driver is soil moisture; with distinct plant communities (and many rare species) associated with seasonally damp drainage lines, which comprise less than 10% of the overall site. Unfortunately some of these drainage lines have generally been heavily invaded by *Acacia saligna* (Port Jackson willow), which has resulted in reduced water availability, and increased shading, and others have been impacted by runoff from farming operations, leading to alien grass invasions, notably *Lolium* species (ryegrass).

5.3 Vegetation overview

About 80% of the overall study area supported Western Ruens Shale Renosterveld, with a ridge of Overberg Sandstone Fynbos on the Dassiesfontein site and a smaller sandstone intrusion on the Klipheuwel site (Mucina & Rutherford 2006). Today most of the remaining natural vegetation is in fact Sandstone Fynbos, as the highly fertile soils on which Renosterveld occurs have been extensively cultivated.

Western Ruens Shale Renosterveld has been very heavily impacted by agriculture within the region where it occurs (Botriver to Bredasdorp) and today less than 13% of its original extent remains (Rouget *et al* 2004). The vegetation type is regarded as a **Critically Endangered vegetation type**, with an unachievable national conservation target of 29%, and only 1% conserved (virtually all of this in private reserves; Rouget *et al* 2004). Intact examples of this vegetation type are typically home to a high number of rare and threatened plant species, many of which are endemic (restricted) or near endemic to the vegetation type. The Draft National List of Threatened Ecosystems (DEA 2009) has also classified this vegetation type as **Critically Endangered** (due to high levels of species endemism). About 50% of the remaining vegetation in the study area is of this type.

Overberg Sandstone Fynbos is as its name suggests, restricted to sandstone soils in the Overberg. Some 5% of this vegetation type has been lost, with a conservation target of 36%. About 36% is formally conserved (Rouget et al 2004), and the unit was classified as Least Threatened on a national basis by the national Spatial Biodiversity Assessment (Rouget et al 2004). However, it is important to note that the Draft National List of Threatened Ecosystems (DEA, 2009) has recently reclassified this vegetation type as **Critically Endangered** (due to high levels of species endemism), and this takes precedence over all preceding classifications. About 50% of the remaining vegetation in the study area is of this type.

Both vegetation types are thus considered to be **Critically Endangered** in national terms.

Alien invasive vegetation is a problem in a few small patches in the Klipheuwel section (notably along the drainage lines), but in the Dassiesfontein section is a much more significant issue, where at least 100ha of natural vegetation have been partly invaded, with little or no evidence of an attempt having been made by the landowner to control invasive vegetation, in spite of CARA (Conservation of Agricultural Resources Act) legislation requiring this. The primary woody invasive aliens are *Pinus radiata* (cluster pine), *Eucalyptus* species (gums), *Acacia saligna* (Port Jackson), *Acacia mearnsii* (black wattle), *Acacia pycnantha* (golden wattle), *Acacia longifolia* (longleaf wattle) and *Hakea* species.

5.2 Plant Species of Conservation Concern

As many as 15 to 20 threatened plant species may occur within the study area or its immediate surrounds, and all these would occur within the areas of remnant natural vegetation (High sensitivity areas mapped in Helme 2010). This is an exceptionally high figure, even for the Fynbos biome, and is indicative of the conservation importance and sensitivity of all remaining natural habitat in the area.

Based on fieldwork undertaken in the area the plant Species of Conservation Concern known to occur within 300m of proposed and existing infrastructure (such as the proposed substation and the existing 80m wind monitoring mast) in the Dassiesfontein study area are *Agathosma* sp. nov. (Critically Endangered), *Metalasia plicata* (Endangered), *Euchaetis schlechteri* (Vulnerable), (*Phylica nigrita* (Near Threatened) and *Serruria inconspicua* (Vulnerable). The former is of particular concern, as it is only known from a single site, not more than 300m from the recently erected 80m wind monitoring mast (see Plate 1), and is thus very vulnerable.

Plate 1: View of 80m wind monitoring mast being erected within an area of pristine, High sensitivity Renosterveld on the Dassiesfontein site (at coordinates 34 14 22.5S and 19 17 31.4E), mapped as such in Helme (2010). The concrete guy line foundations are clearly visible. This is exactly the sort of impact that can, and should be avoided, and it appears that the mast has been erected about 300m from the point where it was authorized to be erected (at coordinates 34 14

20S and 19 17 26E, which would have put it in an cultivated field of Low sensitivity).

6. DESCRIPTION OF ISSUES IDENTIFIED AT THE SCOPING STAGE

Most of the key issues were included within the conclusions of the vegetation scoping document (Helme 2010), and the relevant ones are repeated here, and some are expanded:

- Loss of natural vegetation during the construction stage is likely to be the primary botanical impact. About half will be permanent, and the other half will be temporary, as trampled and partly disturbed areas should eventually recover.
- The least sensitive areas are the previously or currently cultivated areas, which have a Low sensitivity on a regional scale. In order to minimise direct impacts on the vegetation these are the areas where all proposed infrastructure (such as the substations, turbines, roads, construction camp, and operations base) should be placed, if possible.
- Indirect negative effects (habitat fragmentation, disruption of natural fire regime, possible introduction and spread of alien invasive plants and insects) are likely to be relatively insignificant, especially in the context of the ongoing farming operations in the area.
- Cumulative negative effects are likely to be negligible, at least after mitigation.
- It is recommended that roads though areas of natural vegetation be kept to a minimum during planning, construction and operational stages, as this will be one of the primary sources of direct vegetation loss, alien plant and insect introduction, and habitat fragmentation (the latter both indirect effects).
- Indirect botanical impacts after mitigation could be positive if all recommended mitigation is put in place, and all areas of natural vegetation are managed according to an OEMP and formally conserved within the Stewardship Program of CapeNature.
- It is strongly recommended that as part of the OEMP there be no livestock permitted in mapped areas of natural vegetation during the period May to end September. One of the primary reasons for this recommendation is that removal of grazing pressure will have a beneficial effect on the natural vegetation, particularly in terms of natural rehabilitation, in that flowering and seed set of the remaining natural plants (especially pioneers

such as the annuals) will be significantly better in the absence of grazing (which removes the flowers). If the nearby annuals and other plants are not grazed this means that natural rehabilitation of the areas disturbed by the project will be significantly improved, as there will be more locally indigenous seed available nearby for establishment in the disturbed areas.

- Appropriate alien vegetation management is strongly recommended on both sites.

7. METHODOLOGY FOR DETERMINING SIGNIFICANCE OF IMPACTS

Direct, indirect and cumulative impacts of the above issues, as well as all other issues identified, are assessed in terms of the following criteria:

» The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
» The **extent**, where it will be indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international. A score between 1 and 5 will be assigned as appropriate (with a score of 1 being low (site only) and a score of 5 being high (national or international extent).
» The **duration**, where it will be indicated whether:
  * the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
  * the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
  * medium-term (5–15 years) – assigned a score of 3;
  * long term (> 15 years) - assigned a score of 4; or
  * permanent - assigned a score of 5.
» The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
  * 0 is small and will have no effect on the environment;
  * 2 is minor and will not result in an impact on processes;
  * 4 is low and will cause a slight impact on processes;
  * 6 is moderate and will result in processes continuing but in a modified way;
  * 8 is high (processes are altered to the extent that they temporarily cease); and
  * 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
» The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale, and a score assigned:

- Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
- Assigned a score of 2 is improbable (some possibility, but low likelihood);
- Assigned a score of 3 is probable (distinct possibility);
- Assigned a score of 4 is highly probable (most likely); and
- Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).

» the **significance**, which shall be determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high.
» the **status**, which will be described as either positive, negative or neutral.
» the *degree* to which the impact can be *reversed*.
» the *degree* to which the impact may cause *irreplaceable loss of reso*urces.
» the *degree* to which the impact can be *mitigated.*

The **significance** is determined by combining the criteria in the following formula:

S=(E+D+M)P; where

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The **significance weightings** for each potential impact are as follows:

» < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
» 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
» > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

8. IMPACT ASSESSMENT

Impacts may be both direct and indirect, with the former occurring mostly at the construction stage and the latter mostly at the operational stage.

In the case of this project the primary direct impact is loss of natural vegetation (and associated possible Species of Conservation Concern) within some of the development footprints. All hard infrastructure located within or partly within natural vegetation will result in the permanent loss of that vegetation. The

primary sources of permanent loss include (based on the proposed layout) the Dassiesfontein substation (about 0.6ha), and internal access roads (notably the roads between turbines 2 and 3 and 6 and 7 at Klipheuwel). The primary sources of temporary, long-term vegetation loss include excavation and sand piles for the cabling that may be adjacent to the above roads, crane tracks along the above roads, and roads to connect to the Eskom transmission line (Dassiesfontein).

Loss of regionally rare plant species would have a regional impact, as would loss of regionally endemic vegetation types (Overberg Sandstone Fynbos and Western Ruens Shale Renosterveld). Although both these are direct impacts at the site scale they may have indirect consequences (impacts) at the regional scale.

The indirect, negative botanical impacts are not likely to be important, but may include a small degree of habitat fragmentation, and introduction and/or spread of invasive alien plants (mainly along tracks, due to soil disturbance caused). A further potential (but unlikely) indirect impact relates to the source of the gravel for the roads (sources have not yet been identified, although it is assumed that a commercial source will be used) – many gravel quarries are located close to or in Renosterveld areas (pers. obs.). This impact has been deemed to be unlikely as the soils in the area are not deep sands and should not need to be extensively graveled.

The indirect impacts noted above are thus a mix of those that occur at the site and at the regional scale.

8.1 Direct Impact: Permanent loss of natural vegetation

About 98% of the proposed development footprints within the study area will impact primarily on disturbed areas of no or very low botanical significance, but the infrastructure will also impact on small areas (<2ha in total) of Western Ruens Shale Renosterveld and Overberg Sandstone Fynbos – both Critically Endangered vegetation types.

The only infrastructure impacting on the Sandstone Fynbos would be the proposed Dassiesfontein substation, which is located right on the ecotone (transition) between the two vegetation types, and would thus also impact on some Renosterveld vegetation.

The bulk of the loss of Ruens Shale Renosterveld would occur in the footprint of two proposed access roads (and possibly the associated cable trenches) on the Klipheuwel portion of the site. The relevant access roads are between turbines 2 and 3 (275m impacted; see northern section of dark blue line in Figure 2), and between turbines 6 and 7 (680m impacted; see central portion of light blue line in Figure 2) which cross areas of natural Renosterveld. Although there are existing farm tracks in these areas, these are only standard farm tracks which would have to be enlarged during construction for use by the abnormal vehicles used to deliver the turbine components, the concrete trucks used to deliver the concrete, and the 13m wide tracked crane used to lift the turbines into place. Assuming that these tracks will need to be upgraded to a standard 6m wide the total area of these roads would come to just over 5000m^2 (0.5ha), of which about 3000m^2 (0.3ha) would probably be currently natural or partly natural vegetation that will thus be lost.

Direct impacts on individuals of some of the possible plant Species of Conservation Concern are likely within all development footprints referred to above. This may result in a reduction in total number of these species on site by between 1 and 10% (estimated). In a regional context, these losses range from insignificant to low-medium significance.

Table 1:

Nature: Permanent loss of vegetation in development footprint (about 0.8ha)				
	Without mitigation	**Score**	**With Mitigation**	**Score**
Extent	Local and regional	2	Local	1
Duration	Permanent	5	Permanent	5
Magnitude	Moderate	6	Minor	3
Probability	Definite	5	Improbable	2
Significance	**Medium - High**	**65**	**Low**	**18**
Status	Negative		Negative	
Is impact reversible?	No		No	
Irreplaceable loss of vegetation?	Technically - yes		No	
Can impacts be	Yes		Yes	

mitigated?				
Mitigation: See all points in Sections 10 and 12. Most notably the position of Dassiesfontein substation needs to be moved out of the High sensitivity vegetation, and the access road between turbines 6 & 7 in the Klipheuwel section needs to be realigned out of the High sensitivity vegetation area.				
Cumulative impacts: The loss of vegetation is cumulative in that there is ongoing, regional habitat loss within these two Critically Endangered vegetation types – mainly to agriculture, urbanization and alien plan invasion.				
Residual impacts: None, provided that suggested mitigation is carried out.				

8.2 Direct Impact: Long term but temporary loss of natural vegetation

The existing natural vegetation may be severely disturbed (but not totally lost) in the areas adjacent to those referred to in Section 8.1: i.e. the substation construction at Dassiesfontein; heavy machinery movement through some sensitive areas; road construction; and cable trench excavation through sensitive areas. Most of these areas should eventually recover to a significant degree (if natural vegetation is retained in the adjacent areas), but the crushed and dug up vegetation will take at least 12 years (and possibly much longer if rainfall is below normal) in order to recover to a point where at least 80% of the original diversity is once again present. Certain species may not return for many additional years, due to changes in soil structure (compaction or chemical changes). The impacts in this case thus rate as being long term.

Primary sources of disturbance will be the construction of the Dassiesfontein substation; the large crane that is used to erect the turbines, which has caterpillar tracks and a width of 13m; turning circles for long trucks; and the burying of the underground cabling on site.

Table 2:

Nature: Long term but temporary loss of vegetation in footprint (estimated <1ha)				
	Without mitigation	**Score**	**With Mitigation**	**Score**
Extent	Local and regional	2	Local	1
Duration	Long term	4	Permanent	5
Magnitude	Low - Moderate	5	Minor	3
Probability	Definite	5	Improbable	2
Significance	**Medium - High**	**55**	**Low**	**18**

Status	Negative		Negative	
Is impact reversible?	Mostly		No	
Irreplaceable loss of vegetation?	No		No	
Can impacts be mitigated?	Yes		Yes	
Mitigation: See all points in Sections 10 and 12. Most notably the position of Dassiesfontein substation needs to be moved out of the High sensitivity vegetation, and the access road between turbines 6 & 7 in the Klipheuwel section needs to be realigned out of the High sensitivity vegetation area.				
Cumulative impacts: The loss of vegetation is cumulative in that there is ongoing regional habitat loss within these Critically Endangered vegetation types – to agriculture, urbanisation and alien plan invasion, but long term impacts do not typically contribute to cumulative impacts as they are technically reversible.				
Residual impacts: None, provided that suggested mitigation is carried out.				

8.3 Indirect impacts

Indirect ecological impacts are often difficult to identify, and even more difficult to quantify. Some possible indirect negative effects on the vegetation (shading, disturbance of wind flow, etc.) are likely to be minimal and are not assessed further.

Other indirect impacts are likely to be only moderately important, notably the likely disruption in optimal/natural fire regimes in the areas of natural vegetation, although this has probably already been partly disrupted by agriculture on site.

Sandstone Fynbos and Renosterveld are both **fire** driven vegetation types that require fire at least once every 15 years, and fire dependant vegetation types are not compatible with embedded and costly infrastructural developments. If Sandstone Fynbos and Renosterveld are not burnt for over 40 years it can be assumed that at least 30% of the species will become locally extinct, including many of the Species of Conservation Concern. This is one of the many reasons why infrastructure should not be placed within areas of natural vegetation, and developments that take this into account (such as the current one) largely avoid this issue.

The effects of **habitat fragmentation** may also be important in some cases, but the proposed development (after mitigation) should not result in significant further fragmentation of the remaining natural habitat on this site.

Perhaps the most important indirect impact is likely to be the spread of alien invasive vegetation (mainly grasses and herbs) into currently mostly natural areas of vegetation. This is likely to happen as a result of the soil disturbance associated with the development of the two Klipheuwel roads (between turbines 2 and 3 and 6 and 7) and the Dassiesfontein substation.

A further possible indirect impact is the source of road surfacing **material**. The gravel is usually quarried from borrow pits, which may be in sensitive ecological areas (often Renosterveld areas), and could have significant negative impacts if not sourced from an appropriate area. However, at this stage the source, or indeed the need, has not been confirmed (and is deemed unlikely), and material would presumably be only from approved sites (although this does not mean that they are without impact).

Table 3:

Nature: Various indirect impacts: mainly alien invasive vegetation spread and minor habitat fragmentation.				
	Without mitigation	**Score**	**With Mitigation**	**Score**
Extent	Local	2	Local	2
Duration	Long term to Permanent	4	Long term	4
Magnitude	Low to Moderate	5	Low	2
Probability	Probable	3	Improbable	2
Significance	**Medium**	**33**	**Low**	**16**
Status	Negative		Negative	
Is impact reversible?	Partly – in the case of fire.		Partly	
Irreplaceable loss of vegetation?	Unlikely		Unlikely	
Can impacts be mitigated?	Yes		Partially	

Mitigation: Realign the access roads between Klipheuwel turbines 6 and 7, and the Dassiesfontein substation, into areas of Low botanical sensitivity.
Cumulative impacts: Very Low
Residual impacts: None, if correctly mitigated.

8.4 Cumulative impacts

To some extent a cumulative impact is a regional impact, rather than the local site scale impact, *i.e*. if something has a regional impact it also has a cumulative impact.

The impacts of this type of development, and this development in particular, will be significantly less than for various existing and expanding agricultural operations in the region, as well as for the many unmanaged and expanding alien plant invasions on numerous properties in the area.

The proposed WEF thus has a fairly small but still important Low negative cumulative impact in the region, but this can be effectively mitigated on site by redesigning the layout as recommended to avoid the identified High sensitivity areas identified in previous sections, and further by formal conservation and active management of the natural area on site. If effectively mitigated the overall effect could even be positive, due to the management of the areas of natural vegetation and the layout redesign.

8.5 Positive impacts

The proposed WEF could have a slight positive impact in terms of helping to reduce CO_2 emissions by generating "clean energy".

The primary positive impacts (see the two following paragraphs) will only come about if recommendations noted under Mitigation (Sects. 10 & 12) are effectively implemented and enforced.

Seasonal removal of livestock from High sensitivity areas of vegetation on the site could have a positive effect on the natural vegetation, in that it would allow plants to flower and set seed more readily, without being heavily grazed. Disturbed areas will not only rehabilitate faster without livestock grazing but many rarer, currently heavily grazed species may have a chance of increasing

their numbers. Heavy grazing and trampling can also lead to erosion, eutrophication of wetlands, etc.

If most of the natural vegetation on the sites (exact extent not known, but at least 115ha on Klipheuwel, and a larger area on Dassiesfontein) is managed as formal conservation areas this would be a very positive local and regional impact. Western Ruens Shale Renosterveld is a very poorly conserved vegetation type (<1% of original extent conserved, with a national target of 29%), and thus any addition to the total area conserved is to be welcomed. Formal conservation of these natural areas is best achieved by signing these areas up as a Contract Reserve within the Stewardship Program of CapeNature, and details of this are provided in the Mitigation section below.

9. IMPACT STATEMENT AND SUMMARY TABLE

Overall the proposed WEF is likely to have a Medium local (site scale; <3600ha site) and Low to Medium regional (western Overberg; <100 000ha) negative impact on the vegetation on site, prior to mitigation. This could be reduced to Low negative (local) and Low negative (regional) after basic layout mitigation (this would be an acceptable level of impact), or even Low or Medium positive if most natural areas on site are formally conserved and managed (deemed unlikely to happen).

The primary negative impacts on the site are mainly the result of direct impacts, including loss of natural, Critically Endangered vegetation (<1ha) and possible associated Species of Conservation Concern in the development footprints, and medium to long term loss of natural vegetation (<1ha) in adjacent areas that will be disturbed by heavy construction machinery, temporary dumping, etc. Most of these impacts can be avoided / mitigated, by simply re-aligning the proposed layout in the 2 areas where this is an issue and where alternative alignments or positions are possible. The road alignment between Klipheuwel turbines 2 and 3 is unfortunately not easy or feasible to reroute outside the High sensitivity areas, and it is thus assumed that the current layout will remain unchanged in this area.

Indirect impacts are often difficult to quantify and measure, and are often equally difficult to avoid or mitigate. If the mitigation recommendations (See Sects. 10 & 12) are all implemented then indirect impacts on the vegetation on site could be reduced to Low negative.

The primary and important potential positive impact of the development will depend to a large degree on the proper management of the remaining natural vegetation on the sites (exact area unknown, but at least 230ha) as formal conservation areas under the Stewardship Program of CapeNature. The likelihood of this being implemented is not known, but is deemed to be relatively low, as the applicant is not the landowner, and this would thus require contractual agreements between landowner and applicant if the project goes ahead. An indirect positive impact is obviously the small contribution that this WEF would make to reducing CO_2 emissions, and the associated very small reduction in global warming effects.

Table 4: Overall summary table of proposed WEF impacts on vegetation on site (local scale)

Nature: Long term to permanent loss of Critically Endangered vegetation and associated threatened species, as well as minor spread of alien invasive vegetation in disturbed areas.				
	Without mitigation	**Score**	**With Mitigation**	**Score**
Extent	Local and regional	2	Local	1
Duration	Long term to Permanent	4	Mostly long term	3
Magnitude	Moderate	6	Minor	2
Probability	Definite	5	Improbable	2
Significance	**Medium - High**	**60**	**Low**	**12**
Status	Negative		Negative	
Is impact reversible?	Not in direct building footprints (<1ha), but some are in other disturbance areas (<1ha), although will take many years; indirect impacts difficult to reverse.		Not in direct building footprints (<1ha), but some are in other disturbance areas (<1ha), although will take many years; indirect impacts difficult to reverse.	
Irreplaceable loss of vegetation?	Yes, but relatively small areas		No	
Can impacts be	Yes		Yes	

mitigated?				
Mitigation: See all points in Sections 10 & 12, but primary immediate mitigation required is to realign the access roads between Klipheuwel turbines 6 and 7, and the Dassiesfontein substation, into areas of Low botanical sensitivity.				
Cumulative impacts: Low to Medium negative; but Very Low after mitigation				
Residual impacts: There will be no residual impact if all basic mitigation outlined is put in place.				

10. REHABILITATION GUIDELINES AND CEMP & OEMP REQUIREMENTS

Areas requiring rehabilitation will include all areas of natural or partly natural vegetation disturbed during the construction phase and that are not required for regular maintenance operations, or for cultivation. The main areas thus requiring rehabilitation will be recent disturbance to the edges of roads that pass through natural vegetation, the crane tracks alongside the permanent 6m roads, and any cable routings where these fall within areas of natural vegetation.

Rehabilitation should only commence once all construction related disturbance associated with the project has been completed.

Most of the ecological management of the site refers only to the High Sensitivity vegetation areas identified in the baseline report of Helme (2010). As the applicant does not plan to buy the land, these requirements will thus involve contracts between the applicant and the landowners, who will presumably continue to farm most of the land.

Detailed requirements for the Construction Phase Environmental Management Plan (CEMP) are as follows:

1) If any infrastructure is to be placed within the identified areas of High botanical sensitivity (Renosterveld or Sandstone Fynbos; notably the access road and cabling between turbines 2 and 3 at Klipheuwel) all these development footprints (for roads, buildings, underground cables, laydown areas and turbine footings) should be surveyed and fenced off with two strand wire and clearly indicated with flags and/or danger tape strips. Only once this has been done can

anything else proceed. It should be made very clear to all contractors that there is to be no disturbance outside these demarcated areas, at least not without the permission of the ECO.

Objective: Fencing of development footprints in sensitive areas in order to minimise disturbance to adjacent sensitive areas and to make it clear to contractors where they should and should not go.

Project component/s	All phases of construction
Potential impact	Substantially increased damage to adjacent sensitive vegetation, due largely to ignorance of where such areas are located.
Activity risk/source	There is no reason why this objective should not be achieved.
Mitigation: target/objective	No loss of or damage to sensitive vegetation in areas outside immediate development footprint; <0.1ha of construction related disturbance in sensitive areas outside fenced footprints; measured monthly during duration of construction.

Mitigation: Action/control	Responsibility	Timeframe
Two strand wire fencing with droppers every 10m, around all development footprints in areas of natural vegetation; wire to be inter-threaded with danger tape, and signage saying "Sensitive Area – Keep Out" placed on fences every 50m.	ECO	To be completed prior to any construction related activity on site; auditing monthly.

Performance indicator	No damage to surrounding natural vegetation
Monitoring	ECO to monitor all construction areas on a weekly and monthly basis until all construction is completed; immediate report backs to site manager; and ECO to speak to contractors responsible for any infringements

2) Prior to any earthworks within High sensitivity Renosterveld areas a plant Search and Rescue program should be undertaken. Note: Provided that all recommended mitigation is put in place this should only be applicable in a 275m portion of the road areas between turbines 2 and 3 at Klipheuwel. Search and

Rescue (S&R) of certain translocatable, selected succulents, shrubs and bulbs occurring in long term & permanent, hard surface development footprints (i.e. all buildings, new roads and tracks, laydown areas, and turbine positions) should take place. All such development footprints must be surveyed and pegged out as soon as possible, and then a local horticulturist with Search and Rescue experience should be appointed to undertake the S&R (Adriaan Hanekom of Caledon Wildflower Nursery is recommended). All rescued species should be bagged (and cuttings taken where appropriate) and kept in the horticulturist's nursery, and should be returned to site once all construction is completed and rehabilitation of disturbed areas is required. Replanting should only occur in autumn or early winter (April – May), once the first rains have fallen, in order to facilitate establishment. Genera that can be considered for rescue are all bulbs and tuberous species plus selected specimens of succulents such as *Ruschia* and *Lampranthus* species.

Objective: Search and Rescue of all translocatable indigenous plants from development footprints prior to any development, and maintenance of these in a nursery for use in rehabilitation in disturbed areas on completion of all construction.

Project component/s	All phases of construction; replanting during main post construction phase
Potential impact	Substantially increased loss of natural vegetation at construction phase and waste of on-site plant resources, and lack of locally sourced material for rehabilitation of disturbed areas; increased cost of having to buy in material for rehabilitation.
Activity risk/source	There is no reason why this objective should not be achieved, although it will carry cost implications (and savings)
Mitigation: target/objective	Rescue, maintenance and subsequent replanting of at least 20% of the natural vegetation in all development footprints within any areas of High sensitivity natural vegetation on site.

Mitigation: Action/control	Responsibility	Timeframe
Plants that can be considered for rescue are all bulbs and tuberous species, plus selected specimens of succulents such as	ECO and appointed horticultural subcontractor	Search and Rescue to be completed in all

Ruschia and *Lampranthus* species. Material to be bagged up or stored in suitable conditions in a greenhouse (with irrigation where needed); to be replanted in areas requiring rehabilitation in May/June following cessation of all construction related disturbance in particular area.		areas of natural vegetation prior to any construction related activities in these areas; maintenance of material in nursery until May following cessation of disturbance, and replanting of material in May/June.

Performance indicator	Horticulturist to submit list of target species to botanist for approval; rescue of material; replanting in rehabilitation areas to cover 20% of these areas within 3 months of replanting
Monitoring	ECO to monitor Search and Rescue; horticulturist to liase with botanist; botanist to review rehabilitation success after 3 months of replanting of rehabilitation areas.

3) An ECO must be present during the duration of the construction phase.

4) Any excavation within designated High sensitivity areas, including those for cables, must be supervised by the ECO. No excavations may be left open for more than 1 week, and they should preferably be closed up within 1 day, using the carefully stockpiled soil that came out of the trench.

Objective: Minimise disturbance associated with cabling and trench digging in High sensitivity areas; maximise rehabilitation success of these disturbed areas

Project component/s	All phases of construction; rehabilitation immediately post disturbance cessation
Potential impact	Substantially increased disturbance to areas around cabling trenches and reduced rehabilitation success; open trenches have negative impact on fauna
Activity risk/source	There is no reason why this objective should not be

	achieved
Mitigation: target/objective	Minimise period of soil stockpiling alongside trenches and make sure that it is less than one week before trenches are infilled and rehabilitated; target should be one day.

Mitigation: Action/control	Responsibility	Timeframe
All cable trenches, etc, through sensitive areas should be dug by hand in order to minimise damage to surrounding areas; all stockpiled sand should be replaced within one week of trench opening.	ECO and appointed horticultural subcontractor	Infilling to be complete within one week of cable trench commencement (ideally within 1 day); rehabilitation to be undertaken within one week of infilling.

Performance indicator	Trenches should ideally not disturb an area more than 3m wide in total (including soil pile areas); trenches should not lie open for more than 7 days and should ideally be closed up the same day.
Monitoring	ECO to monitor trenching and rehabilitation; horticulturist to liase with botanist about rehabilitation; botanist to review rehabilitation success after 3 months of sowing in rehabilitation areas, and to recommend additional measures if rehabilitation deemed insufficient.

5) No dumping or temporary storage of any materials may take place outside designated and demarcated laydown areas.

6) Only suitable locally indigenous Western Ruens Shale Renosterveld species should be used for rehabilitation or planting anywhere on site. This means that no exotic or invasive species should be used for rehabilitation, and this includes commonly used invasive grass species such as ryegrass (*Lolium* spp).

Operational Phase EMP Requirements:

7) It is strongly recommended that the landowners should refrain from grazing livestock in the High sensitivity vegetation areas in the main winter and spring growing and flowering periods (1 May – end October). One of the primary reasons for this is that removal of livestock grazing pressure will have a beneficial effect on the natural vegetation, particularly in terms of natural rehabilitation, in that flowering and seed set of the remaining natural plants (especially pioneers such as the annuals) will be significantly better in the absence of grazing (which removes the flowers). If the nearby annuals and other plants are not grazed this means that natural rehabilitation of the areas disturbed by the project will be significantly improved, as there will be much more locally indigenous seed available nearby for establishment in the disturbed areas, and the site may also act as a seed source for some nearby overgrazed areas.

Objective: No grazing of livestock in the High sensitivity vegetation areas in the main winter and spring growing and flowering periods (1 May – end October).

Project component/s	Construction and Operational phase; ongoing
Potential impact	Grazing and trampling substantially decreases rehabilitation success, posing a risk of erosion and biodiversity loss; grazing and trampling impacts negatively on flowering and seed set of many rare plant species
Activity risk/source	There is no reason why this objective should not be achieved, but it would require cooperation from the landowners
Mitigation: target/objective	Ecologically functional and flourishing natural vegetation in the area, with rare species flowering and setting seed successfully.

Mitigation: Action/control	Responsibility	Timeframe
Removal of all livestock from all High sensitivity areas of natural vegetation on site from 1 May to end October.	ECO (construction phase) and CapeNature (if involved), site manager and landowners (operational phase)	Ongoing from construction into operational phase

Performance indicator	No livestock on site in High sensitivity areas of natural vegetation during period 1 May to end October. No evidence of grazing or trampling in these areas during this period, and good flowering and seed set in palatable plant species.
Monitoring	Botanist to review regeneration and seed set success in palatable species every two years, and to check site for compliance in terms of livestock.

8) All temporary fencing and danger tape should be removed once the construction phase has been completed.

9) Ongoing alien plant monitoring and removal should be undertaken on all areas of natural vegetation within the project area on an annual basis, with emphasis on areas within 200m of any infrastructure. DWA approved methodology should be employed for all alien clearing operations. No earthmoving machinery should be used for this purpose, as this disturbs the soil and creates ideal conditions for re-invasion. All stems of resprouting species (notably *Acacia saligna*) must be cut as close to ground level as possible, using loppers or chainsaws (depending on size), and stumps must be immediately hand painted with a suitable Triclopyr herbicide (e.g. Garlon, Timbrel, with colour dye) to prevent resprouting. If this is not done within 5 minutes of being cut *Acacia saligna* will resprout, wasting the original effort. No herbicide spraying should be undertaken anywhere within natural vegetation, due to the extensive collateral damage. All cut branches should be stacked into a pyramid (cut ends up) and left to dry – where rodents will eat the available seed under the pile, reducing seed germination. Annual follow ups are required in all areas that have been previously cleared. Small seedlings may be hand pulled.

Objective: Removal of all woody alien invasive vegetation within the project area, within two years of project commencement, and particularly within the High sensitivity areas of natural vegetation. To be undertaken from project inception, on an ongoing basis.

Project component/s	Construction and Operational phase; ongoing
Potential impact	Alien invasive vegetation is currently a major threat to the Dassiesfontein site, and a minor threat to the Klipheuwel area. Alien vegetation may displace rare species, dry out wetlands, and result in habitat loss, as

	well as increasing the fuel load and the consequent risk of a wildfire. If unchecked the alien vegetation could come to dominate the entire Dassiesfontein site within 20 years, with loss of rare species.
Activity risk/source	There is no reason why this objective should not be achieved, although it will be costly, and adequate budget must be made available for ongoing clearing costs.
Mitigation: target/objective	Ecologically functional natural vegetation in High botanical sensitivity portions of site; all High Sensitivity areas within 200m of any infrastructure are clear of alien vegetation within 2 years of project inception.

Mitigation: Action/control	Responsibility	Timeframe
DWA approved methodology should be employed for all alien clearing operations. Dense areas should be tackled last – the priority is to prevent their spread, and then gradually clear the entire area, maximising cost efficiency. Areas should not be burnt until an area has been clear for at least one year, in order to prevent coppicing and massive seed germination. *Acacia saligna* (Port Jackson), *Hakea sericea* (silky hakea) and *Pinus radiata* (pine) are the primary invasive aliens. No bulldozing or removal by any machinery is allowed, as this disturbs the soil and creates ideal conditions for re-invasion. All stems must be cut as close to ground level as possible, using loppers or chainsaws (depending on size), and stumps must be immediately hand painted with a suitable Triclopyr herbicide (e.g. Garlon, Timbrel, with colour dye) to prevent resprouting. If this is not done within 5 minutes of being cut Port Jackson will resprout, wasting the original effort. No herbicide	ECO (construction phase) and appointed alien clearing contractors (operational phase and perhaps also overlapping with construction phase)	Ongoing from construction into operational phase. High sensitivity areas should be cleared initially only from November - April; and all follow ups only from Oct – April, to minimise damage to seasonal species

spraying should be undertaken anywhere, due to the extensive collateral damage. All cut branches should be stacked into a pyramid (cut end up) and left to dry – where rodents will eat the available seed under the pile, reducing seed germination. Annual follow ups are required in all areas that have been previously cleared (to be undertaken Oct-April). Small seedlings may be hand pulled.		

Performance indicator	All High Sensitivity areas of vegetation within 200m of infrastructure to be cleared of invasive aliens within 2 years of project inception (initial clearing); <1% alien cover in these areas in following years
Monitoring	Annual audits of alien clearing by independent botanist or CapeNature representative (if involved) to determine compliance, and to suggest any changes to program

10) The applicant must ensure that there is sufficient budget to implement all management recommendations noted above.

11. CONCLUSIONS

- There are two natural vegetation types on site, both of which are regarded as Critically Endangered on a national basis, and the remaining areas of natural vegetation can all be expected to supported various plant Species of Conservation Concern. Significant portions of the initial study area support vegetation in medium to pristine condition, and were mapped as being of High sensitivity in the baseline study of Helme (2010). Ideally no development should occur within identified High sensitivity areas, and all infrastructure should ideally be located at least 30m from the edge of any High sensitivity areas. The majority of the study area is cultivated or disturbed land of Low botanical sensitivity, and presents no botanical constraints to the proposed facility.
- Overall the proposed WEF is likely to have an unacceptable Medium – High negative impact on the vegetation on site, prior to mitigation. This could

easily be reduced to an acceptable Low negative level with basic mitigation involving realignment of an access road and a repositioning of the Dassiesfontein substation.

- The proposed WEF could even have a Low or Medium positive impact if all areas of High sensitivity vegetation in the study area are managed appropriately (annual alien vegetation management, no grazing in winter – spring flowering season), and are formally conserved within CapeNature's Stewardship Program. The likelihood of this happening is however not known, and is considered to be low, as it would require negotiated contracts between the landowners, the applicant and CapeNature.
- If the essential mitigation and the CapeNature Stewardship Program recommendation is all implemented then this project could potentially serve as an example of best practice wind energy facility development and management.

12. RECOMMENDED SITE SPECIFIC MITIGATION

- It is recommended that all infrastructure be located within existing areas of Low sensitivity (see Helme 2010), as far as possible. This means that some relocation of infrastructure out of Critically Endangered natural vegetation remnants will be necessary.
- The Dassiesfontein substation must be moved out of its current location in a High sensitivity area, along with all infrastructure feeding into it. It is suggested that it be moved 175m northwest, into a Low sensitivity area (cultivated land; centred on the coordinates 34 14 37.9S and 19 17 16.4E), or possibly immediately southwest of turbine 4. This also presumably means that a number of proposed cable trenches will have to be rerouted, and in all cases these can easily be located within agricultural land, where they will have minimal botanical impact.
- The final position of turbine 6 on the Klipheuwel site should be as indicated by the yellow placemark in Figure 2. The coordinates for this position are 34 14 07.6S and 19 22 57.6E.
- The preferred position for the access road and cable trench connecting turbines 5, 6 and 7 on the Klipheuwel site is indicated in Figure 2 by the light green line. The original routing, as indicated by the pale blue line, should be scrapped.
- The first 275m of the proposed access road (and cable trench) connecting turbines 2 and 3 at the Klipheuwel site runs through an area of Critically

Endangered vegetation and is the only impact within a High sensitivity area that is not easy to avoid. It is thus suggested that impact in this area be minimized by: 1) fencing off of the 6m wide development corridor prior to any development, to prevent inappropriate or unnecessary access to adjacent sensitive areas 2) Search and Rescue of all translocatable plant species within this fenced off development footprint must be undertaken by Caledon Wildflower Nursery staff prior to road construction or grading (see point 2 of Section 10 for details) 3) the cable trench through this area must be dug by hand, unless it can be routed within the designated road corridor.

- The maintenance /control building (if constructed) must be located with a Low sensitivity area (cultivated or disturbed area).
- An ECO must be permanently on site throughout the road construction, cable laying, turbine foundation excavation, and during the erection of the turbines, and at other times should visit the site at least once a week until the construction phase is completed.
- Any excavation, including those for cables, must be supervised by the ECO. No excavations may be left open for more than 1 week, and they should preferably be closed up within 1 day, using the carefully stockpiled soil that came out of the trench. In the case of turbine footings some 45m^3 of soil will presumably be displaced by the concrete, and this should not be dumped on any natural vegetation.
- No dumping or temporary storage of any materials may take place outside designated and demarcated laydown areas, and these must all be located within areas of Low botanical sensitivity (agricultural areas).
- All feasible (as determined by CapeNature) areas of High botanical sensitivity (identified in the Scoping study of Helme 2010) must be formally declared and registered as a Contract Nature Reserve with CapeNature's Stewardship Program, within one year of project initiation (defined as installation of the first project related infrastructure; subject to CapeNature capacity in the area). This may entail a rezoning of these areas (to Open Space), and will require that a management plan for these areas is drawn up, which should include the clause that these areas may not be grazed by livestock between 1 May and end October. In some cases small, isolated patches or strips of mapped High sensitivity habitat may not be deemed feasible or suitable by CapeNature, and in this case these areas could then be excluded from the final Contract Reserve. Significant financial incentives are available for landowners who register land as a

Contract Reserve, including write-offs of the management costs and portions of the capital costs, and a reduction in annual Land Tax. Associated with these benefits are requirements for a management plan and environmental auditing to ensure that management is adequately carried out. In this case all costs associated with rezoning and management of these areas will remain the responsibility of the applicant and/or landowners.

- The contract between the landowner/s and the applicant must include the relevant clauses concerning the need for CapeNature Stewardship Program involvement in the identified priority conservation areas on the site (as outlined in the previous bullet). The independent botanist and the CapeNature Stewardship Program coordinator must both confirm in writing that these clauses are in the contract, within 3 months of any authorisation.
- Both the botanist and the CapeNature Stewardship Coordinator must verify in writing, within 1 yr of project inception, that the Stewardship Program commitments involving both the landowner/s and the applicants have in fact been adequately implemented.
- A CEMP and OEMP should be drawn up, which must outline management steps for all the areas of natural vegetation on the site. See Section 10 for detailed guidelines.
- A botanist familiar with the vegetation of the area should ensure that adequate botanical inputs are made into the construction and operational phase EMPs.

13. REFERENCES

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