23rd Sept

15 Augustril 2011

Attention: Ms Mariagrazia Galimberti
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Already on SAHRIS
case ID: 1649

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Dear Ms Galimberti,

EIA FOR THE PROPOSED WKN WINDCURRENT WIND ENERGY PROJECT (UBUNTU PROJECT) NEAR JEFFREY'S BAY IN THE EASTERN CAPE (Dept of Environmental Affairs EIA reference: 12/12/20/1752)

SUBMISSION OF DRAFT EIA REPORT

Please find included a CD and a hard copy containing the Draft EIA Report for the proposed 100 MW Ubuntu Wind Energy Project near Jeffrey's Bay in the Eastern Cape. This report has been submitted to the national Department of Environmental Affairs. The report is released for public comment from 18 August to 26 September 2011. A public meeting will be held on Friday, 23 September 2011. A copy of the Draft EIA report and more details regarding the public meeting can be downloaded from: www.publicprocess.co.za.

The following authorities have also been couriered a hard copy and/or CD of the Draft EIA Report:

Name	Organisation	Town	Telephone
Mr Conrad Agenbach	National DEA	Pretoria	012 – 310 3711
Ms Marissa Bloem	Dept of Water Affairs	Port Elizabeth	041 – 586 4884
Mrs Lizna Fourie	Dept of Water Affairs East London	East London	043 - 701 0248
Mrs Anneliza Collett	Dept of Agriculture Forestry and Fisheries	Pretoria	012 319 7508
Mr Marius Keyser	EC Dept of Roads and Transport	Algoa Park	041 - 452 2073
Mr Andries Struwig	Dept of Economic Affairs, Environment & Tourism	Port Elizabeth	041 508 5815
Ms Mariagrazia Galimberti	SAHRA	Cape Town	021 -462 4502
Mr Iqbal Hoosen	Civil Aviation Authority	Port Elizabeth	041 398 3200
Dr Eddie Rankwana	Kouga Municipality (Municipal Manager	Jeffrey's Bay	042 – 200 2212
Ms Carina Strydom	Kouga Municipality (LED Manager)	Jeffrey's Bay	042 – 200 2200
David Ernest Eldendorff	Kouga Municipality (Councillor)	Jeffrey's Bay	071 911 9850
Mr Kevin Leask	Eskom	Johannesburg	011 800 8111

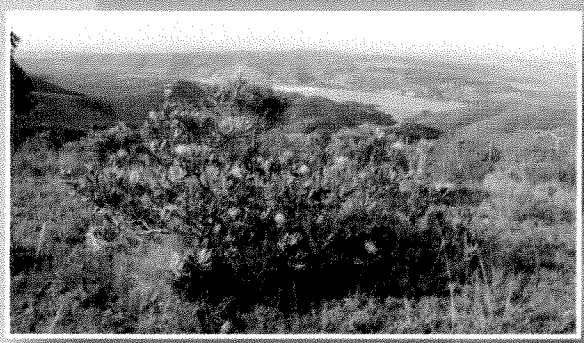
Yours sincerely,

SA HERITAGE RESOURCES AGENCY
RECEIVED
17 AUG 2011

Minnelise Levendal
Tel.: 021 – 888 2495/2661;Fax: 021 – 888 2693; e-mail: mlevendal@csir.co.za

WKN Windcurrent

Environmental Impact Assessment for the proposed Ubuntu Wind Energy Project near Jeffrey's Bay, Eastern Cape: Draft Environmental Impact Assessment Report



DEA Ref Number: 12/12/20/1752

CSIR Report Number: GWDMS STEL GEN 9716

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Public Process Consultants
Environmental Impact Assessment and Public Participation Management

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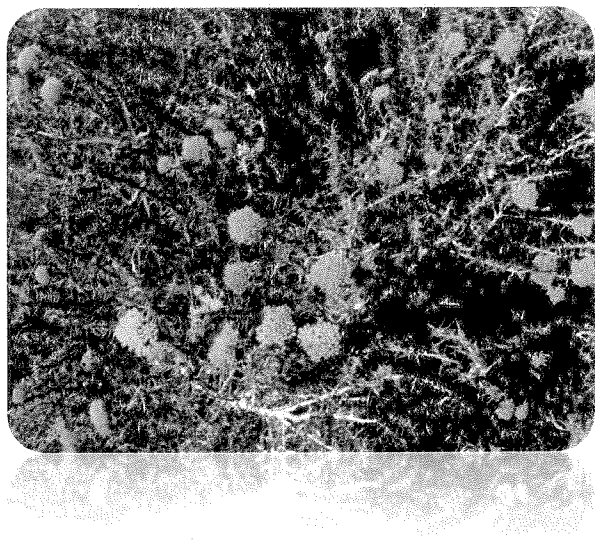
our future through science

August 2011

Environmental Impact Assessment for the proposed Ubuntu Wind Energy Project near Jeffrey's Bay, Eastern Cape: Draft Environmental Impact Assessment Report



Report Details

Title:	**Environmental Impact Assessment for the proposed WKN-Windcurrent Ubuntu Wind Energy Project near Jeffrey's Bay: Draft Environmental Impact Assessment Report**
Purpose of this report:	This Draft EIA Report and Environmental Management Plan (EMP) form part of a series of reports and information sources that are being provided during the EIA process for the proposed Ubuntu Wind Project near Jeffrey's Bay. In accordance with the EIA Regulations, the purpose of the Draft EIA Report is to: ▪ *Present the proposed project, including project alternatives and the need for the project;* ▪ *Describe the affected environment, including the planning context, at a sufficient level of detail to facilitate informed decision making;* ▪ *Provide an overview of the EIA process being followed, including public consultation;* ▪ *Assess the predicted positive and negative impacts of the project on the environment;* ▪ *Provide recommendations to avoid or mitigate negative impacts and to enhance the positive benefits of the project;* ▪ *Provide a draft EMP for the design, construction and operational phases of the project.* The Draft EIA Report and EMP are being made available to all stakeholders for review. All comments on the Draft EIA and EMP will be considered in preparation of the Final EIA and EMP and are to be submitted to Public Process Consultants. The Final EIA Report and EMP will then be submitted to the national Department of Environmental Affairs for decision-making.
Prepared for:	WKN-Windcurrent SA (Pty) Ltd *Contact person*: Mr Alan Wolfromm

Prepared by:	CSIR, P O Box 320, Stellenbosch, 7599, South Africa *Contact person*: Minnelise Levendal Tel: +27-21-888 2495/2661/2460 Fax: +27-21-888 2693
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CSIR Report No.	GWDMS STEL GEN 9716
CSIR Project No.	CASKG87
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Date	August 2011
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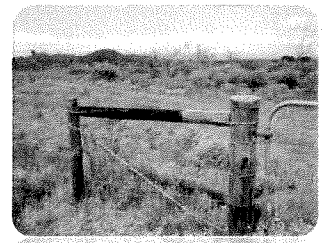


PROJECT OVERVIEW

WKN-Windcurrent SA (Pty) Ltd (referred to as "WKN-Windcurrent") is proposing the construction of a 100 MW wind energy facility on the Farms Zuurbron and Vlakteplaas near Jeffrey's Bay in the Kouga Municipal area, Eastern Cape Province. The proposed project is referred to as the Ubuntu Wind Energy Project.

The proposed Ubuntu project will be located on the farms Zuurbron and Vlakteplaas in the Kouga Municipality approximately 4 km to 7 km north north west of the town of Jeffrey's Bay as follows (see locality map in Figure S 1):

- Remainder of Farm 830, Kransplaas, (Farm Zuurbron);
- Portions 2/3/4/5/6/7 of Farm 854 (Farm Vlakteplaas);
- Farms 307/5; Div Humansdorp;
- 307/6; Div Humansdorp;
- 307/7 Div Humansdorp; and
- Farm 845, Div Humansdorp.

The proposed project will be undertaken in two phases, both of which are covered in this EIA:

- *Phase 1* (2013): Installed capacity up to 50 MW
- *Phase 2* (2013): Additional installed capacity of up to 50 MW, bringing the total installed capacity up to 100 MW.

Phase 1 will have a total capacity of up to 50 MW, which can readily accommodated by the existing transmission infrastructure without the need for any upgrades and would consist of up to a maximum of 25 turbines.

Phase 2 consists of additional turbines, identical to the turbines used in the Phase 1, to bring the total capacity of the wind farm from both phases up to 100 MW. The capacity of the turbines that are considered ranges from 2 MW to 3 MW. The total number of turbines could therefore vary from 33 turbines of 3 MW to 50 turbines if a 2 MW turbine is used.

The existing 132 kV overhead transmission line will be used to connect between the wind farm and the transmission system (Eskom grid). A new 132 kV substation will be built on site to connect to the existing 132 kV transmission line.

A separate Basic Assessment (Department of Environmental Affairs Reference number: 12/12/20/1753) was undertaken from January to June 2010 for the establishment of a wind monitoring mast on Farm Zuurbron prior to the development of the wind farm. This application was undertaken under the NEMA EIA Regulations published in GN R 385, 386 and 387 on 21 April 2006. Subsequently Amended NEMA EIA Regulations (Notices GN R. 543, 544, 545, and 546) were published in the Government Gazette No. 33306 of 18 June 2010, and came into effect from 2 August 2010 (referred to as the 2010 EIA Regulations). A wind monitoring mast is no longer a listed activity in terms of the 2010 EIA Regulations. The monitoring mast has subsequently been erected and is 80 m high.

NEED FOR THE PROJECT

The aim of this project is to generate electricity that will be fed into the national or the provincial grid by erecting a wind farm of 100 MW. In mid-2011, the South African government indicated a change in pricing strategy for renewable energy. Instead of applying a predetermined renewable-energy feed-in tariff (Refit), as previously indicated,

the government would conduct a selection process that would involve both price and non-price elements. This requires bidders to propose their price per MWh for the energy output to be generated, along with full or partial inflation indexation. The price indication would be for the first 20 years of operation, or for the duration of the power purchase agreement (PPA). On 3 August 2011, the Department of Energy (DoE) released the qualification and proposal documentation for South Africa's first renewable energy independent power producer (IPP) tender process, and announced that it has allocated a total of 3 725 MW capacity across various renewables technologies, with 1 850 MW set aside for onshore wind. This allocation to wind energy is an increase on the 1 025 MW set out for the first procurement round in the Integrated Resource Plan (IRP) 2010-2030 (Source: Engineering News, 4 & 5 August 2011).

At a national scale, renewable energy (in particular, wind energy) has the potential to play an important role in meeting South Africa's energy demand through diversifying the sources of power generation whilst reducing the country's carbon footprint from power generation. Currently, approximately 93% of South Africa's power generation is derived from coal. The proposed Ubuntu project of 100 MW could offset over 200 000 tonnes of CO_2 per year, or 4 000 000 tonnes of CO_2 over the lifetime (20 years) of the project.[1,2] Wind farms have a relatively short construction lead time and could therefore be quickly developed to meet South Africa's power need. Coal fired power stations used approximately 292 million cubic metres of water, or 1.5% of national water consumption, for electricity generation during 2005. The future availability and treatment costs of water therefore present a serious challenge for the economic sustainability of South Africa's current (coal-based) electricity supply.

The Eastern Cape Province is reliant on electricity imports from other provinces yet houses significant industrial and rural development potential. Power from the national grid is largely generated from coal power stations, and transmitted considerable distances to the Eastern Cape (e.g. from Mpumalanga). This leads to significant transmission losses and local grid instabilities. Electricity supply to the Eastern Cape Province is further constrained by transmission infrastructure. Eskom currently supplies approximately 1 400 MW of electricity to the Eastern Cape Province.

Against the background of international commitments to generation of "green energy" with low or zero CO_2 emissions, the intention of this project is to generate additional electricity that will be fed into the national grid by installing a wind farm with a capacity of 100 MW. The objective of the Ubuntu project is to support the growing demand for electricity by means of renewable energy and to lower the emissions of carbon dioxide (CO_2) into the atmosphere. Electricity generated by wind energy, that replaces the use of fossil fuels, results in greenhouse gas emission reductions. Wind energy is a national imperative. A constrained national energy supply and South Africa's commitments to meeting its 2013 CO_2 reduction target and to the Kyoto Protocol require the rapid deployment of renewable energy, of which wind power has the greatest commercial potential.

At a provincial level, the project aims to assist the Eastern Cape in achieving improved

[1] http://www.iea.org/co2highlights/
[2] http://www.sunearthtools.com/dp/tools/CO2-emissions-calculator.php?lang=de#txtCO2_3

energy stability and security. The local wind climate in the Humansdorp region creates the potential for a wind energy project to generate electricity, thereby contributing towards the provision of sustainable renewable energy.

PROJECT DESCRIPTION

Wind turbines and wind monitoring masts

Thirty three to fifty turbines will be erected (the actual number will be dependent on the capacity of the turbines selected in the range between 2 and 3 MW). The turbines will have an expected hub height from 80 m to 105 m and a blade diameter from 90 m to 112 m. The turbines will be supported on foundations dimensioned to the geotechnical properties, for example reinforced concrete spread foundations of approximately 20 m by 20 m and 3 m in depth. Electrical transformers will be placed beside or in (the nacelle) of each turbine. Hard standing areas will be established adjacent to each turbine for use by cranes during construction and retained for maintenance use throughout life span of the project. Gravel roads, approximately 5 m wide, will be necessary to provide access to each turbine site, with the intent being to upgrade existing roads as far as possible.

A wind monitoring mast has been erected on site. A maximum of three additional wind monitoring masts of up to 100 m in height may be installed.

Electrical connections

The wind turbines will be typically connected to each other and to the substation using medium voltage cables which will, in most cases, be buried approximately 1 m below-ground, except where a technical assessment of the proposed design suggests that above ground lines are appropriate. A new sub-station and transformer to the 132 kV Eskom grid will be constructed on Farm Vlakteplaas. The substation will preferably be located close to the 132 kV line. The connection from the substation to the Eskom grid line is a stretch of overhead line supported on an intermediate pole(s), depending on the location of the substation relative to the 132 kV line.

Other infrastructure

Operations and maintenance building: A single storey building, maximum 5000 m^2, with warehouse / workshop space and access, office and telecoms space and security and ablution facilities as required. This preferably should be situated preferably close to the substation.

Temporary activities during construction

A lay down area is necessary for the assembly of the turbine components, beside an access route, of maximum area 10 000 m^2 – this hard standing area could be temporary or if the landowner prefers, left for long-term use. The overall site compound for all contractors would be a maximum of 5000 m^2. Existing borrow pits will be used as far as possible for road upgrades. The size of these pits will be dependent on the terrain and need for granular fill material for use in construction. At the end of construction these borrow pits will be backfilled as much as possible using surplus excavated material from the foundations.

Construction and operational phases

The construction will be undertaken in three distinct components: Civil construction; Electrical installation and wind turbine

erection; and Commissioning. The construction and commissioning phases are expected to require a total period of 8 to 15 months. The operational life span of the wind turbines is expected to be 20 years. Turbine life can be extended beyond 20 years through regular maintenance and/or upgrades in technology.

REQUIREMENTS OF AN ENVIRONMENTAL IMPACT ASSESSMENT

In terms of the regulations promulgated under Chapter 5 of the National Environmental Management Act (Act 107 of 1998) ("NEMA") published on 21 April 2006, Scoping and Environmental Impact Assessment (EIA) is required for this project. The need for Scoping and EIA is triggered by, amongst other, the inclusion of activities listed in GN R 387, in particular:

1 "The construction of facilities of infrastructure, including associated structures of infrastructure, for-

(a) the generation of electricity where-

(i) the electricity output is 20 Mega Watts or more; or

(ii) the elements of the facility cover a combined area in excess of 1 hectare."

It is noted that **Amended NEMA EIA Regulations** (Notices GN R. 543, 544, 545, and 546) were published in the Government Gazette No. 33306 of 18 June 2010, and came into effect from 2 August 2010 (referred to as the 2010 EIA Regulations). This EIA application by WKN-Windcurrent was initiated in December 2009, prior to the enactment of the Amended Regulations, and will therefore be dealt with in terms of GN R 385, 386 and 387. However, in line with Regulation 76 (3) of the Amended EIA Regulations regarding transitional arrangements, any impacts associated with listed activities which are included in the Amended listing notices, which were not listed under the listing notices GN R386 and 387, would need to be assessed as part of this EIA process. CSIR has therefore checked the new listed activities and have included the ones relevant to this project in Table 4.1 of Chapter 4.

APPROACH TO THE EIA

An application to conduct the EIA process was submitted to the national Department of Environmental Affairs (DEA) in December 2009. The application was accepted and the project moved into the Scoping phase. The Final Scoping Report and Plan of Study for EIA were submitted to DEA in April 2011, with the notice to proceed to the EIA phase issued by DEA on 7 July 2011. The Draft EIA Report is now being released to stakeholders for a 40-day comment period. All comments received will be included in the Final EIA Report, which will be submitted to DEA for review and decision-making. This Draft EIA Report is available in the Jeffrey's Bay and Humansdorp Municipal Libraries; and on the project website at www.publicprocess.co.za. Hard copies and/or CDs containing the document will be sent to key stakeholders, including authorities. All I&APs on the project database have been notified of the release of the Draft EIA Report and EMP.

The Environmental Management Plan (EMP) is available as PART B of this report. The EMP is based on the recommendations made by specialists for design, construction and operation of the project.

PROJECT ALTERNATIVES

The "no-go" alternative was included in the EIA as a benchmark against which to assess the impacts (positive and negative) of the proposed Ubuntu Wind Energy Project. Apart from the "no-go" alternative, various other types of alternatives are considered in this EIA. These are described in Chapter 4 of this Draft EIA Report, with the main alternatives being location, land use, technology, turbine scale and turbine layout alternatives.

WKN-Windcurrent has prepared three alternative layouts based on three alternative suppliers and turbine sizes (see alternative layouts in Figures 4.7-4.9 of Chapter 4 in the DEIA Report). In addition to the three potential turbine layouts listed above WKN-Windcurrent is also proposing four additional turbine locations. These alternative turbine locations will be used should the current proposed locations not be favourable from an environmental perspective. The current layouts prepared by WKN-Windcurrent were reviewed by the specialists working on the project and went through several iterations. The current layouts were informed by the identification of buffer zones or no-go areas identified by the specialists (see Figure S2).

IMPACT ASSESSMENT AND MITIGATION

The key issues identified during the scoping process, and assessed during the EIA, were investigated and specialist studies conducted. The overall impacts (after mitigation) are summarised below:

- Impacts on terrestrial fauna and flora: **Low** (negative);
- Impacts on birds: **Low to Medium** (negative); (low for collision mortality and medium for displacement of birds);
- Impacts on bats: **Low** (negative), (confidence levels are medium as it is based on 2 months monitoring data);
- Visual impacts: **High** (negative);
- Noise impacts: **Low** (negative);
- Economic impact: **Low** (negative), **Medium** (positive) for project investment/ expenditure;
- Impacts on archaeology: **low** (negative); and
- Impacts on palaeontology: **low** (negative)

The main findings of these studies are outlined below, together with proposed mitigation and recommendations:

IMPACTS ON TERRESTRIAL FAUNA AND FLORA

FLORA

Mucina & Rutherford classify vegetation units present within the wind farm sites as Humansdorp Shale Renosterveld (Endangered), Gamtoos Thicket (Least threatened) and Loerie Conglomerate Fynbos (Least threatened). Most of the wind farm infrastructure will occur in areas that are transformed cultivated pastures, thus minimising the overall impact to natural vegetation. Areas with an elevated vulnerability (moderate to high) include intact Humansdorp Shale Renosterveld, seeps, drainage lines and wetlands and thicket habitat on slopes. Sixteen terrestrial vegetation impacts that may occur during the construction and operational phases of the proposed project have been identified, which

can be divided into three key types of impacts, namely:

- Loss of vegetation habitat;
- Reduction or changes to ecological processes and functioning. This include temporary fragmentation of habitats, increased risk of alien invasion in drainage lines and disturbed areas, changes in natural fire regime and overall reduction of ecosystem functioning; and
- Loss of species of special concern (SSC) and SSC habitat.

Mitigation

- Protected flora or species of special concern must be removed from the development footprint to be safeguarded from destruction and relocated either to undeveloped areas or off-site in consultation with conservation authorities and relevant botanical specialists;
- Permission must be obtained from the provincial authorities to destroy or remove any protected plant species as per legislation;
- A long term alien plant management plan to control these invasive species must be implemented within the designated Open Space areas;
- Appropriate measures must be implemented where infrastructure crosses drainage lines or seeps and no turbine footprints or lay down areas will be sited within recommended wetland and riparian buffers; and
- Kikuyu grass must not be utilised during re-grassing of verges, turbine footprints and other landscaped areas within the site, particularly adjacent to riparian habitat.

Overall the impacts on terrestrial flora are estimated to be **negative** and of **low** significance (after mitigation).

FAUNA

Five key faunal impacts have been identified and assessed, namely:

- Habitat destruction of habitat;
- Road mortalities;
- Increased poaching risk;
- Fauna harmed by fences; and
- Corridor disruptions as a result of habitat fragmentation.

The species that will be mostly affected during the construction phase of this project are those that can't vacate the affected area themselves, e.g. tortoises, burrowing reptiles and burrowing mammals. These species can suffer direct mortality during construction activities. Traffic on the access roads to and from the construction sites would most likely result in road kills, including possible amphibian migrations during rainy periods. As indicated, some species of special concern are found in the area and will be affected by this development. All amphibians are of least concern and are well protected elsewhere. The reptiles of special concern are the FitzSimons long-tailed Seps and the Elandsberg Dwarf Chameleon. Although these species are well protected elsewhere (e.g. Lady Slipper Nature Reserve), their known distribution is limited. The likelihood of them being significantly affected by the proposed development is however low. The impact on the terrestrial fauna will largely be temporary and is expected to return to its normal state after construction, other than road mortalities, the risk of which are likely to persist.

Mitigation

- Removal of animals from the affected areas before the start of site clearing and construction, and relocating these to safe areas would only be a valid mitigation option in the case of tortoises, so far as reasonable possible. All other reptile and small mammal species are extremely difficult to catch and it would be futile to attempt to relocate them. Before site clearing, affected areas should be thoroughly searched for tortoises. Tortoises found must be released in adjacent unaffected areas.
- A speed limit of 60 km/h needs to be implemented on the access roads to the site and a 40 km/h speed limit on the construction sites and for the cranes.
- Appropriate speed control measures must be implemented to keep vehicular traffic speeds to within recommended limits.
- Road design must be such that it allows free movement of fauna.
- All staff active on site must be instructed and briefed regarding the strict faunal management requirements before construction commences.
- Any fencing must be kept to minimum and recommended measures implemented to minimise risk of impacts to fauna.

All terrestrial floral and faunal impacts have been assessed and it is estimated that these can be mitigated from **moderate to low** impact through implementation of the recommended mitigation measures during the operational and construction phases of the proposed wind farm development.

IMPACT ON BIRDS

The main potential impacts of the project on birds are collisions with the project infrastructure, potential displacement of priority bird species and habitat loss as a result of the project. These are discussed below.

WKN-Windcurrent has commissioned a pre-construction bird monitoring programme on site since January 2011. Subsequently the "*Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa*" (Jenkins *et al.* 2011) by the Endangered Wildlife Trust (EWT) and BirdLife South Africa (BLSA) was released in the public domain on 31 March 2011. The monitoring protocol used in this study was designed before the publication of the guideline document but was subsequently, after the publication of the guidelines, adapted to conform more to the published guidelines.

Collision mortality on wind turbines

The following preliminary conclusions can be drawn from the pre-construction monitoring done to date as far as potential collision of priority species with wind turbines are concerned, subject to further monitoring:

- Soaring species e.g. African Fish-Eagle, African Harrier-Hawk, African Marsh-Harrier, and Jackal Buzzard are most at risk of collisions, with the exception of Secretarybirds, which seem to fly very seldom.
- Black Harriers spend most of their flying time below rotor height, which is typical of their foraging behaviour. Southern Pale Chanting Goshawks generally fly below rotor height, which is also typical foraging behaviour.
- No clear pattern emerged for large terrestrial species. Blue Crane and Denham's Bustard flew during light and strong wind conditions, with no flights recorded in calm and moderate wind

conditions. White-bellied Korhaan flew in all wind conditions, with most flights in strong wind conditions.
- Terrestrial species i.e. Blue Cranes, White-bellied Korhaan and Denham's Bustard, based purely on the number of medium altitude flights recorded, may also be at risk, but in the case of Denham's Bustard, the risk could be reduced due to the potential of displacement when the wind farm is operational.
- Collision risk is higher in summer than in winter, when passage rates are higher, largely because of an influx of migrants.
- Flight patterns of priority species at medium altitude recorded to date do not indicate any distinct flight corridors which will necessitate the relocation of any of the proposed turbine locations. This is subject to further monitoring being conducted.
- Most flights take place during light and moderate wind conditions.
- Most flights take place during north-westerly winds.
- The overall collision risk estimates per turbine per year for priority species (summer and winter data only) as a group is low.

Potential displacement of priority bird species

The following preliminary conclusions can be drawn from the pre-construction monitoring done to date:

- The survey area is particularly well suited for Denham's Bustard and White-bellied Korhaan.
- Grassland is the most important priority species habitat – it comprises 50% of the habitat in the survey area, but it contained almost 93% and 74% of birds recorded in summer and winter respectively.
- For reasons not quite clear at this stage, Blue Cranes were recorded more regularly in summer than in winter.

At this stage, it can only be speculated about the impact of potential displacement on large terrestrial birds in the study area, particularly Denham's Bustard, White-bellied Korhaan, Blue Crane and Secretarybird as this will only become apparent once the post-construction monitoring commences. If the birds are displaced, this could potentially be the most significant impact of the wind farm on the avifauna.

In addition to transect surveys and point counts, focal point monitoring of suspected nest sites of priority species was also undertaken. In the course of the monitoring, a suspected Secretarybird nest was located (33^0 55' 35.33" S; 24^0 52' 29.70" E), which is about 340 m from the nearest proposed turbine.

Habitat Loss

The scale of direct habitat loss resulting from the construction of a wind farm and associated infrastructure depends on the size of the project but, generally speaking, is likely to be small per turbine base. Typically, actual habitat loss amounts to 2–5% of the total development area. Direct habitat loss is not regarded as a major impact on avifauna compared to the potential impact of collisions with the turbines and, in particular, potential displacement due to disturbance.

The infrastructure footprint must be restricted to the minimum, in accordance with the recommendations of the ecological specialist study.

Assessment rating

As far as collision mortality is concerned, it is predicted that the project will have a negative impact of Low significance (with mitigation). This will have to be verified by post-construction monitoring. It can be stated with confidence that wind farms generally have a lower collision mortality impact than power lines, which has proven to be a major cause of significant unnatural mortality. Birds generally have a high avoidance rate for wind turbines.

As far as displacement of birds is concerned, no firm conclusions can be drawn without actual post construction monitoring. Priority species likely to be affected include Blue Cranes, Secretarybirds and Korhaans. It is predicted that the project will have a **negative** impact of **Low to Medium** significance (with mitigation), depending on whether habituation takes place, or off-set compensation is implemented.

Mitigation

- Post-construction monitoring should be implemented to assess the impact of displacement, particularly on priority species. Initially, a 12-month period of post-construction monitoring should be implemented, using the same protocol as is currently implemented. Thereafter, the need for further monitoring will be informed by the results of the initial 12-month period;
- The breeding activity of the pair of Secretarybirds at the site must be carefully monitored. If the birds actually commence with breeding at the nest site, their nesting activity must continue to be monitored throughout 2011. In the unlikely case of them re-using the nest in 2012, appropriate mitigation must be agreed upon between the avian specialist and the project proponent to ensure that the birds are not disturbed during the critical nesting period of August to October.
- Should the results of the post-construction monitoring indicate significant displacement of priority species, appropriate offset compensation should be negotiated with developer to compensate for the loss of priority species habitat. Another mitigation measure is to halt operation during peak flight periods, or reducing rotor speed to reduce the risk of mortality.
- During the construction period, activity should be restricted to the construction footprint itself. Access to the rest of the properties must be strictly controlled to prevent unnecessary disturbance of birds.

This report should be seen as work in progress since full results of the pre-construction monitoring programme will only become available later in 2011, when the spring monitoring has been completed. The final results of the current baseline monitoring will then be available to feed into the final lay-out of the turbines.

IMPACT ON BATS

Bats play important functional roles as insect predators, pollinators and seed dispersers. They are sensitive to changes in mortality rates and their populations tend to recover slowly from declines. Bats can be classified into three broad functional groups on the basis of their wing morphology and echolocation call structure. Of these groups, open-air foragers, bats that have a wing design and echolocation call adapted to flying fast, high above the vegetation, are mostly at risk from wind turbine developments.

The Ubuntu Wind Energy Project falls within the distributional ranges of 13 species that have been recorded in the area. Open-air foragers, who could forage up to 500 m above ground, are most likely to be negatively impacted upon by the turning turbine blades, because the blades will be within the range of their foraging altitude. Species that migrate over the proposed development site will be further at risk, regardless of their foraging behaviour.

The most important aspect of the project that would affect bats adversely are the wind turbines themselves, and in particular, the operational turning blades. The main direct impacts related to the proposed development are:

- Loss of foraging habitat;
- Direct collisions with the rotating turbine blades; and
- Fatalities from barotraumas (i.e. effect of a change in air pressure caused by the rotation of the wind turbine blades on the internal organs of the bats, such as lungs).

There is furthermore a cumulative impact related to the density of wind farms in the Jeffrey's Bay/Humansdorp vicinity.

The site was visited during January and May 2011. Except for a few buildings, which at the time of the site visits had no indication of bat roosts, the proposed site does not contain habitat that is attractive to bats. It must be noted though that areas bordering the proposed development have habitat that is attractive to bats, such as open water bodies and the overhanging cliffs of the Kabeljous valley.

WKN-Windcurrent has commenced with a bat monitoring programme on site from 19 May 2011. The monitoring is informed by "*The South African Good Practice Guidelines for Surveying Bats in Wind Farm Development* (Sowler and Stoffberg, 2011)". During May three Anabat bat detecting recorders were installed on site. The monitoring data for May and June have been included in the bat specialist report included as Chapter 7 of the DEIA. Limited numbers of *Neoromicia capensis*, *Miniopterus natalensi* (Near Threatened), *Myotis tricolor* (Near-threatened in SA), *Taphozous mauritianus*, *Tadarida aegyptiaca* were recorded on site. Of these species, *Tadarida aegyptiaca* and *Taphozous mauritianus* are open air foragers. It is therefore expected that they will be negatively impacted upon by the wind turbine development.

The current turbine layouts have been informed by recommendations from the bat specialist working on this project. Therefore buffer zones have been incorporated in the layout to exclude areas that might have bat activity, such as open water bodies and derelict buildings.

If data collected up to now is taken into account, the impact of the wind turbines on bats at the Ubuntu Wind Energy Project is predicted to be **negative** and of **low** significance with mitigation. Confidence levels are medium, as only two months of monitoring data have been incorporated, but the report will be updated with additional information from the forthcoming monitoring results.

Mitigation

- Bat monitoring to continue and include spring and Summer, as well as more extensive Autumn monitoring;
- Post-construction monitoring should be implemented;

- If further monitoring data confirms low bat activity, the main mitigation proposed is to completely seal off roofs of new buildings within the study area, and those of existing buildings that do not have any bats roosting in them at present within the study area, so as to prevent bats from moving in, thus making them more prone to coming into contact with the turbines in the surrounding area;
- If a high number of bats are recorded during the following ten months monitoring, bat roost sites could be established (e.g. roost boxes) as a trade-off to offset potential mortalities during turbine operation; and
- If future monitoring data shows high activity, the client together with a bat specialist should investigate further mitigation measures. This includes an increase in buffer zone distance, depending on the foraging habitat of species that will be impacted upon, and refining operational procedures of the turbines, such as to increase turbine cut-in speed. (i.e. minimum wind speed at which blades start rotating, currently 4 m/s).

VISUAL IMPACT

Visual or aesthetic impacts will occur during the construction, operational and decommissioning phases of the proposed project. The main visual impacts of the proposed Ubuntu Wind Energy Project are:

- Visual impact on the landscape;
- Visual impact on viewers;
- Intrusion of large highly visible wind turbines on the existing views of sensitive visual receptors; and
- Visual impact of night lights of a wind farm on existing nightscape.

The wind farm will be located within a mixed landscape containing agricultural and coastal resort elements. Agricultural landscapes have a low sensitivity to changes brought by wind farms, and the coastal resort landscapes in Kouga are rapidly changing as towns expand and merge.

The wind farm will be built on a highly visible plateau above the N2, and it will potentially be visible over a large region. Viewers who will be most affected by the wind farm are those living on farms surrounding the development site, especially for viewpoints west and south of the site where existing views contain relatively few man-made structures and a sense of remoteness prevails. However, there are not many sensitive viewers in these areas who will be highly exposed to the wind farm. Views from Jeffrey's Bay are unlikely to be affected severely since scenic views are normally directed at the mountains to the north or towards the sea. Protected areas in the region are generally too far from the site to be highly impacted.

Assessment rating:

The significance of the impact on the landscape character of the region is **moderate** since the impact duration is long and its extent regional, but the intensity is expected to be low.

The significance of the visual impact on sensitive viewers during the construction phase of the wind farm is **high** due to the number of sensitive viewers who will be affected. Not all of the construction phase will necessarily have a negative visual impact since the construction of wind turbines is an incredible engineering feat and viewers are likely to find it fascinating to observe.

The overall significance of the visual impact on sensitive viewers during the operational phase of the wind farm is **high** due to the regional extent, long term and severe effect of the impact. The intensity of the impact is expected to be high for a number of highly sensitive viewers (residents) who will potentially be highly exposed to the wind farm, and since there are no structures of similar size in their existing views the visual intrusion will be high.

The significance of the impact of lighting of the turbines according to aviation regulations is expected to be **moderate** for residents living in close proximity, but **low** overall since it is unlikely to contribute to light pollution and there is an existing sky-glow produced by settlements and other developments in the region which will often be a backdrop to views of the lights.

Mitigation

- Dust suppression is important as dust will raise the visibility of the development.
- New road construction should be minimised and existing roads should be used where possible.
- The contractor should maintain good housekeeping on site to avoid litter and minimise waste.
- Clearance of indigenous vegetation should be minimised and rehabilitation of cleared areas should start as soon as possible.
- Erosion risks should be assessed and minimised as erosion scarring can create areas of strong visual contrast with the surrounding vegetation, which can often be seen from long distances since they will be exposed against the hillslopes.
- Laydown areas and stockyards should be located in low visibility areas (e.g. valleys between ridges) and existing vegetation should be used to screen them from views where possible.
- Night lighting of the construction sites should be minimised within requirements of safety and efficiency.
- Ensure that there are no wind turbines closer than 500 m to a residence.
- Maintenance of the turbines is important. A spinning rotor is perceived as being useful. If a rotor is stationary when the wind is blowing it is seen as not fulfilling its purpose and a negative impression is created (Gipe 1995).
- Signs near wind turbines should be avoided unless they serve to inform the public about wind turbines and their function. Advertising billboards should be avoided.
- According to the Aviation Act, 1962, Thirteenth Amendment of the Civil Aviation Regulations, 1997: "Wind turbines shall be painted bright white to provide maximum daytime conspicuousness. The colours grey, blue and darker shades of white should be avoided altogether. If such colours have been used, the wind turbines shall be supplemented with daytime lighting, as required."
- Lighting should be designed to minimise light pollution without compromising safety. Investigate using motion sensitive lights for security lighting. Turbines are to be lit according to Civil Aviation regulations.
- An information centre (provided that it is located in a low visibility area) and trails along the wind farm can enhance the project by educating the public about the need and benefits of wind power. 'Engaging school groups can also assist the wind farm proponent, as energy education is paramount in developing good public relations over the long term.

Instilling the concept of sustainability, and creating awareness of the need for wind farm developments, is an important process that can engage the entire community' (Johnston 2001). This has also been borne out by a more recent study on the effect of wind farms on tourism in which respondents said they would visit wind farms as long as there was an information centre (Frantál & Kunc 2010).

- The aviation standards have to be followed and no mitigation measures are applicable in terms of marking the turbines. Lighting of ancillary buildings and structures should be designed to minimise light pollution without compromising safety. Motion sensitive lighting can be used for security purposes.

NOISE IMPACT

The noise impact during the construction period will be localised around the turbine sites, as well as noise from construction vehicles accessing the sites. There will be a short term increase in noise in the vicinity of the site during the construction phase as the ambient noise level will be exceeded. The impact during the construction phase will be difficult to mitigate. The significance of the construction noise impact is predicted to be **low** (without mitigation).

Noise impacts were modelled for the operational phase, taking into consideration noise sensitive areas (i.e. receptors of noise impacts, such as offices or houses). The noise modelling (using WindPro Software) is precautionary, and does not take into account the masking effect that ambient wind noise will have on the turbine noise. Ambient noise increases as the wind speed increases. Under very stable atmospheric conditions (e.g. temperature inversion or a light wind), the turbines will in all likelihood not be operational as the cut-in speed is 4 m/s. As the wind speed increases above the cut-in speed, the ambient noise will also increase. If the atmospheric conditions are such that the wind is very light (<4 m/s) at ground level but exceeds the cut-in speed at hub height, it is feasible that little ambient noise masking will occur. The critical wind speeds are thus between 4-6 m/s when there is a possibility of little masking. Above 8 m/s the wind noise starts masking the turbine noise. The noise modelling indicates that, in general, noise from the turbines will be below the SANS10103 limits for rural areas at a distance of approximately 500 m from the turbines.

Provided that the mitigation measures presented below are implemented effectively the overall noise impact (with mitigation) is expected to be **negative** and of **Low** significance.

Mitigation

- All construction operations should only occur during daylight hours if possible.
- No construction piling should occur at night. Piling should only occur during the hottest part of the day to take advantage of unstable atmospheric conditions.
- Ensuring that construction staff is given "noise sensitivity" training.
- Ambient noise monitoring is recommended at three NSA's per year over a three year period.

ECONOMIC IMPACTS

The main impacts identified during the construction and operational phases of the project include the following:

- Impacts on land owners within the site boundaries;
- Impact on surrounding land uses;
- Impacts on tourism; and
- Impacts on commercial activity associated with expenditure linked to the construction and operation of the development.

It is highly likely that the impacts on land owners within the site boundaries would be net positive. The project would provide a welcome source of additional income while allowing existing farming activities to continue and introducing relatively minimal risks and potential negative impacts with adequate mitigation. No significant negative impacts on the agricultural activities on surrounding farms are anticipated for the same reason mentioned above.

Assessing the overall risk to tourism (i.e. considering negatives and positives) needs to be recognised as an exercise with high levels of uncertainty. Nevertheless, considered as a whole, a low to medium level of risk for tourism with mitigation is anticipated.

The project has the potential to have a highly significantly positive impact on economic activity in the local area and sub-region given the size of the new spending injection associated with it and the need for economic opportunities. Preliminary estimates indicate that a total of approximately R1.6 billion would be spent on the entire construction phase. Approximately 187 jobs of one year duration would be associated with the entire construction phase with the majority of jobs in the low and medium skill sectors as expected. It is anticipated that approximately 82 of these jobs would be allocated to workers from the Kouga Municipal area and a further 72 to workers from the rest of the Eastern Cape. Direct incomes flowing to construction workers from the Kouga Municipality area would amount to R9.7 million over the course of the project while R11.7 million would accrue to workers from the rest of the Eastern Cape. With regard to direct employment during operations, it is expected that approximately 10 direct employment opportunities would be created by the project equally spread across skill levels. Although initially high skill positions probably will have to be filled by foreign technicians (with a view to filling positions with locals over time), medium and low skill positions will offer immediate opportunities for locals and those from the region.

The overall impact on economy (with mitigation) is expected to be **negative** and of **low** significance. The impacts associated with project investment/expenditure is expected to be **positive** and of **medium** significance given the significance of the injection relative to economy.

Mitigation

- Implement recommendations of noise, visual, ecological, bird and bat specialist studies;
- Adequate setbacks from buildings, structures and residences to be strictly enforced;
- Set targets for use of local labour and maximise opportunities for training;
- Use local sub-contractors where possible; and
- Explore ways to enhance local community benefits with a focus on broad-based BEE through mechanisms such as community shareholding schemes and trusts.

IMPACT ON ARCHAEOLOGY

Only a few weathered quartzite Middle Stone Age stone tools were observed where the pebble/cobble gravels were exposed by ploughing. These stone tools date between 30 000 and 250 000 years old. They were mainly thick, small 'informal' flakes and chunks manufactured from quartzite. All stone tools were in secondary context and not associated with any other remains. Although none was found, one would also expected to find occasional Earlier Stone Age stone tools (1,5 million – 250 000 years old) in the gravels as well.

The nearest important cultural sites to the proposed development are the Kabeljous Rock Shelters (2,5 kilometres south of the closest turbine), a large number of sites along the coastline (7 kilometres south of the closest turbine) and Sara Baartman's grave site at Hankey (8 kilometres north of the closest turbine). The turbines will have little or no visual impact on the Kabeljous Rock Shelters because the shelters face south and are situated in the kabeljous River valley along the eastern embankment. The turbines will be visible from the coastal sites and possibly also from Sara Baartman's grave.

The area investigated appears to be of low archaeological sensitivity and the impact of construction will be insignificant. The isolated distribution of the finds, their very low numbers, and the fact that all of the occurrences occur in a disturbed context (ploughed fields) mean that the archaeological remains located during the study are in secondary context and are rated as having **low** significance. It is also highly unlikely that any archaeological heritage remains of any value will be found in situ or of any contextual value. The impact of the development on archaeological sites/materials will be limited. The area is also situated more than five kilometres from the coast which is further than the maximum distance shell middens are expected to be found inland. No such features were observed.

Mitigation

- In the unlikely event that any concentrations of archaeological material are uncovered during further development of the site, it should be reported to the Albany Museum and/or the South African Heritage Resources Agency immediately so that systematic and professional investigation/excavations can be undertaken. Sufficient time should be allowed to remove/collect such material.
- The visual effect of the development on important cultural sites in the wider area, such as Sara Baartman's grave and archaeological sites along the nearby coast must be included in the visual investigation for community/public consultation. The development will have little or no effect on the Kabeljous River Rock Shelters due to their location in the Kabeljous River valley.
- Construction managers/foremen should be informed before construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow when they find sites. It is suggested that a person be trained to be on site to report to the site manager if sites are found.

IMPACT ON PALAEONTOLOGY

The study area is largely underlain by fluvial conglomerates and minor sandstones of the Mesozoic Enon Formation (Uitenhage Group) that are locally mantled with a veneer of pebbly relictual soils of the so-called

Bluewater Bay Formation (Algoa Group). Both of these rock units are very sparsely fossiliferous, so any proposed development on the coastal plateau here is likely to have very little impact on the local palaeontological heritage.

On the other hand, beds of sandy marls reported towards the base of the Enon succession near the Kabeljourivier may prove fossil-rich (e.g. plant compressions) and are therefore of palaeontological interest. Marine sediments – mainly dark mudrocks - of the Devonian Bokkeveld Group underlying the Kabeljousrivier valley on the western margin of the study area have yielded invertebrate fossils (notably various brachiopods) in the past, although most fossils in these rocks have probably been destroyed by tectonic deformation or weathering since the break-up of Gondwana in Cretaceous times.

The operational and decommissioning phases of the Ubuntu Wind Energy Project are unlikely to have any significant impacts on local fossil heritage. The overall impact on palaeontology (with mitigation) is therefore expected to be **negative** and of **Low** significance.

Mitigation

- Any substantial fresh excavations into lower Enon or Bokkeveld Group rocks in the Kabeljousrivier Valley area should be recorded, sampled and monitored by a qualified palaeontologist during the construction phase of this development, at the expense of the project proponent. An appropriate schedule and *modus operandi* for monitoring should be negotiated by the palaeontologist with the proponent before construction starts.
- Should substantial fossil remains be exposed at any stage during development, these should be safeguarded - *in situ*, if feasible – and recorded by the responsible Environmental Control Officer (photos, GPS readings). SAHRA should be alerted as soon as possible so that appropriate mitigation measures may be considered.

OVERALL EVALUATION OF IMPACTS BY ENVIRONMENTAL ASSESSMENT PRACTITIONER

No negative impacts have been identified that, in the opinion of the Environmental Assessment Practitioner, should be considered "fatal flaws" from an environmental perspective, and thereby necessitate substantial re-design or termination of the project.

The EIA process included a synthesized mapping of "no go" areas using environmental constraints provided by the specialist team (Figure 13.1). This mapping guided the layout of turbines and internal access roads and cabling. In this way, the environmental and social constraints of the site informed the scale and configuration of the proposed project. Through the course of the EIA process, the project layout went through several iterations after consultation with the specialists on the project team. This indicates how the EIA process has actively and effectively informed the project planning. The specialists have used the three layouts as presented in Chapter 4. They were satisfied with these layouts provided their proposed mitigation measures were implemented.

Residual impacts are those that are expected to remain once appropriate mitigation has

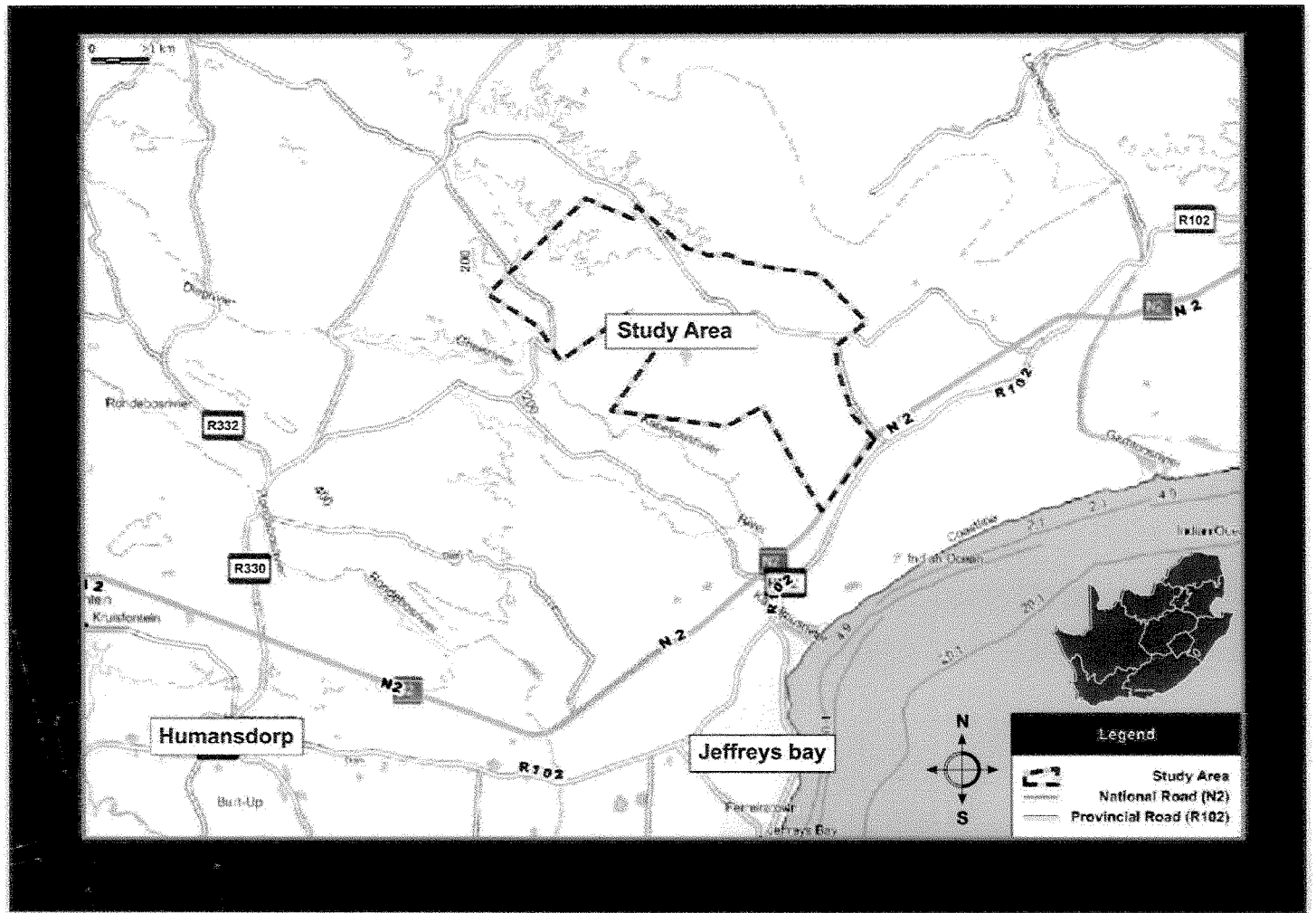
been implemented. The main residual negative impacts of the Ubuntu Wind Energy Project are the predicted impact on birds and bats, and the visual impact.

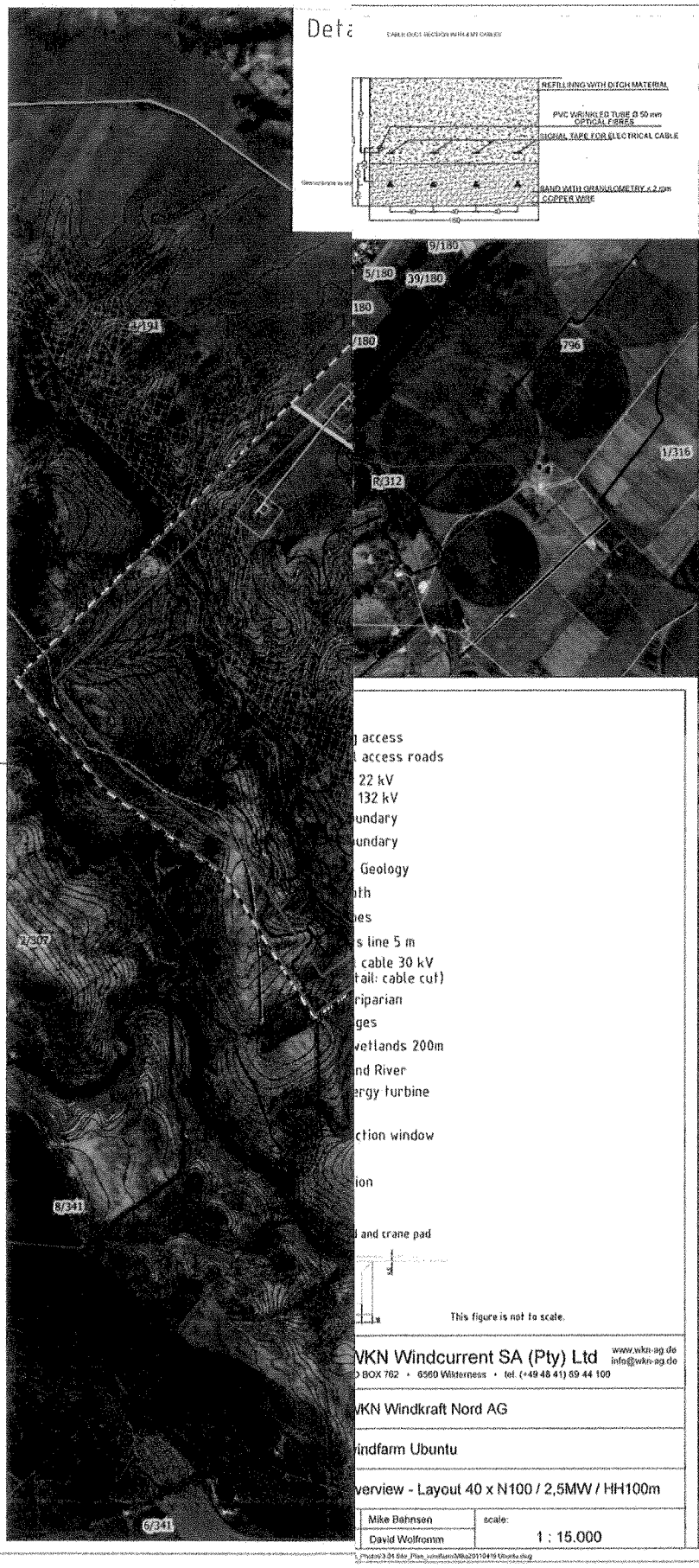
- The impact on birds arises from the possible displacement of priority bird species during the construction and operational phases of the project. The impacts are predicted to be low to medium (after mitigation).
- Another impact is infrequent bat mortality due to collision with the wind turbine blades or barotrauma and the visual impact of the turbines on the sense of place. The impacts on bats are predicted to be of **low** significance after mitigation (**confidence level is medium** as this is based on preliminary bat monitoring data). There is a general paucity of bat data in South Africa, and therefore ongoing pre-construction monitoring of bats on site is proposed to build a better understanding of the bat populations present and determine what management actions could be effective.
- The visual impacts of the turbines on the landscape character are predicted to be of **high** significance (negative). However, the visual impact could be perceived as a positive impact as the project represents a move towards renewable energy, which is a strategic priority for South Africa and the Eastern Cape Province. Of the several wind projects proposed in the Kouga area, the Ubuntu project is in perhaps the least sensitive location in terms of visual impacts, in that it is located at least 3 km inland of the N2 national road, and well inland from the coastal towns such as St Francis Bay and Jeffrey's Bay,

If the Ubuntu wind farm is established, the actual physical footprint of the wind turbines is limited to approximately 0.09 % of the total study area of 1 138 ha, and grazing and other agricultural activities can continue in parallel with the operation of the turbines. The project will have no significant impact in terms of loss of agricultural productivity.

In conclusion, given South Africa's need for additional electricity generation and efforts to decrease the country's proportional dependency on coal-based power, renewable energy has been identified as a national priority, with wind energy identified as one of the most readily available, technically viable and commercially cost-effective sources of renewable energy. Taking into consideration the findings of the EIA process for the proposed Ubuntu project near Jeffrey's Bay, it is the opinion of the Environmental Assessment Practitioner that the project benefits outweigh the costs, and that the project will make a positive contribution to steering South Africa on a pathway towards sustainable development. Provided that the specified mitigation measures are applied effectively, it is proposed that the project receives Environmental Authorization in terms of the EIA Regulations promulgated under the National Environmental Management Act (NEMA).

***Figure S.1**: Locality map of the proposed Ubuntu Wind Energy Project near Jeffrey's Bay in the Eastern Cape*




Deta
CABLE DUCT SECTION WITH 4 MV CABLES
REFILLING WITH DITCH MATERIAL
PVC WRINKLED TUBE Ø 50 mm
OPTICAL FIBRES
SIGNAL TAPE FOR ELECTRICAL CABLE
SAND WITH GRADULOMETRY 4 x 2 mm
COPPER WIRE
9/180
5/180
39/180
180
/180
796
1/316
R/312
4/291
1/307
8/341
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access
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indfarm Ubuntu
verview - Layout 40 x N100 / 2,5MW / HH100m
Mike Bahnsen
David Wolfromm
scale:
1 : 15.000

Glossary

ADU	Animal Demographic Unit
AEWA	African-Eurasian Waterbird Agreement
AMSL	Above mean sea level
BA	Basic Assessment
BFD	Bird Flight Detector
BFD	Double Loop Bird Flight Diverter
BID	Background Information Document
BLSA	BirdLife South Africa
CAR	Coordinated Avifaunal Roadcounts
CARA	Conservation of Agricultural Resources Act (CARA) (Act 43 of 1983)
CBA	Critical Biodiversity Areas
CBD	Convention on Biological Diversity
CEMP	Construction Phase Environmental Management Plan
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CS	Cultural Significance
CSIR	Council for Scientific and Industrial Research
DEA	National Department of Environmental Affairs
DEIA	Draft Environmental Impact Assessment
DEM	Digital Elevation Model
DoE	Department of Energy
DSR	Draft Scoping Report
DTM	Digital Terrain Model
DWA	Department of Water Affairs
EAP	Environmental Assessment Practitioner

ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ENPAT	Environmental Potential Atlas
ESA	Ecological Support Areas
ESA	Early Stone Age
ESO	Environmental Site Officer
EWEA	European Wind Energy Association
EWT	Endangered Wildlife Trust
FEIA	Final Environmental Impact Assessment
FSR	Final Scoping Report
GDP	Gross Domestic Product
GIS	Geographic Information System
GLVIA	Guideline for Involving Visual and Aesthetic Specialists in EIA Processes
HAWT	Horizontal Axis Wind Turbine
I&AP	Interested and Affected Party
IBA	Important Bird Area
IDP	Integrated Development Plan
IPP	Independent Power Producer
IRP	Integrated Resource Plan
IUCN	International Union for Conservation of Nature
kWh	Kilowatt Hours
MW	Megawatts
NEMA	National Environmental Management Act (Act 107 of 1998)
NHRA	National Heritage Resources Act (Act 25 of 1999)
NR	Nature Reserve
NSA	Noise Sensitive Area
NT	Nationally near threatened
NWCC	National Wind Coordinating Committee
OEMP	Operational Phase Environmental Management Plan
PES	Present Ecological State

PIA	Paleontological Impact Assessment
PPA	Power Purchase Agreement
PPC	Public Process Consultants
PRS	Perceived Reference State (the undisturbed state prior to human settlement in an area).
PSEIA	Plan of Study for EIA
QDGCs	Quarter degree grid cells
QDS	Quarter degree squares
RA	Raptor
RECs	Renewable Energy Certificates
REFIT	Renewable Energy Feed-in Tariff
S&R	Search and Rescue
SABAP	Southern African Bird Atlas Project
SACAA	South African Civil Aviation Authority
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
SS	Special regional significance
SSC	Species of Special Concern (plants)
STEP	Subtropical Thicket Ecosystem Project
ToR	Terms of Reference
VAWT	Vertical Axis Wind Turbine
VIA	Visual Impact Assessment
VU	Nationally vulnerable
WPDA	World Database on Protected Areas
WT	Wind Turbine
WTG	Wind Turbine Generator
ZTV	Zone of Theoretical Visibility
ZVI	Zone of Visual Influence

GLOSSARY OF TERMS

Aestivation	a state of animal dormancy, characterized by inactivity and a lowered metabolic rate, that is entered in response to high temperatures and arid conditions.
Ambient noise	Totally encompassing sound in a given situation at a given time, and usually composed of sound from many sources, both near and far. **Note:** Ambient noise includes the noise from the noise source under investigation.
Annoyance	General negative reaction of the community or person to a condition creating displeasure or interference with specific activities
Annual	Completing the cycle from seed to death in one year or season
Arboreal	Living in trees
A-weighted sound pressure level (L_{pA} and $L_{Aeq,T}$)	A-weighted sound level L_{pA} which is the sound pressure level at specific frequencies and is given using the following equation: $L_{pA} = 10\text{Log}\left(\frac{P_A}{P_O}\right)_2$ Where: *PA* = is the root-mean-square sound pressure, using the frequency weighting network A *PO* = is the reference sound pressure (*PO* = 20 µPa). A-weighted sound pressure level is expressed in decibels dBA . **Note:** For clarity in this study L_{pA} shall equal $L_{Aeq,T}$
Biennial	Completing the cycle from seed to death in two years or seasons
Boundary	Landscape patches have a boundary between them which can be defined or fuzzy (Sanderson and Harris 2000). The zone composed of the edges of adjacent ecosystems is the boundary.
Composition	refers to the number of patch types (see below) represented on a landscape, and their relative abundance
Connectivity	relates to how intact patches of indigenous vegetation are (i.e. it is the opposite of fragmentation). "Functional" connectivity refers to the ability of connective corridors to sustain ecosystem processes common to linked patches. The measure of how connected or spatially continuous a corridor, network, or matrix is. For example, a forested landscape (the matrix) with fewer gaps in forest cover (open patches) will have higher connectivity.

Corridors	have important functions as strips of a particular type of landscape differing from adjacent land on both sides. habitat, ecosystems or undeveloped areas that physically connect habitat patches. Smaller, intervening patches of surviving habitat can also serve as "stepping stones" that link fragmented ecosystems by ensuring that certain ecological processes are maintained within and between groups of habitat fragments. ○ An array of subtle yet complex interactions between plants and animals sustains the natural environment. Many ecological processes that could not be directly mapped as a GIS layer may still be conserved by maintaining closely-connected patches of natural vegetation. Areas where patches of remaining natural vegetation are considered relatively connected (within approximately 500 m or less of each other), and which support identified ecological processes, should be considered when identifying suitable "ecological corridors" for conserving biological diversity. ○ Key considerations when identifying ecological corridors that can contribute to the conservation of biodiversity: ▪ support connections between remaining natural habitat ▪ support connections between critically endangered or endangered vegetation and large, intact areas of natural vegetation ▪ include a diverse array of natural habitats, including wetlands ▪ include significant ecological processes that contribute to the regional persistence of biodiversity ○ Due consideration of certain of these processes (such as the maintenance of natural fire regimes) should also be incorporated into good land use management practices for the remaining natural vegetation and immediate surrounding areas.
Critically Endangered	critically endangered terrestrial ecosystems have lost so much of their original natural habitat (more than 80 % lost) that ecosystem functioning has to a large extent broken down and a significant proportion of species associated with the ecosystem have been lost or are likely to be lost.
Cumulative impact	Cumulative impact are defined as the impact on the environment, which results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (CEQ, 1997).
Cumulative viewshed	A viewshed which indicates in some way how much of a development is visible from a particular viewpoint. In a raster based cumulative viewshed each pixel value will indicate how many points within the development area are visible. A power line development could, for example, use pylons as points to generate a cumulative viewshed for the development. Each pixel value in the viewshed will be a count (accumulation) of the number of pylons that will potentially be visible from that pixel.
dBA	The decibel is the unit used to measure sound pressure levels. The human ear does not perceive all sound pressures equally at all frequencies. The "A" weighted scale adjusts the measurement to approximate a human ear response.
Digital Elevation Model (DEM)	A digital or computer representation of the topography of an area.

Disturbance	an event that significantly alters the pattern of variation in the structure or function of a system, while fragmentation is the breaking up of a habitat, ecosystem, or land-use type into smaller parcels. Disturbance is generally considered a natural process.
ECO/ESO	Environmental Site/Control Officer – person responsible for the Day-to-Day Environmental Management on-site during construction.
Ecocline	a type of landscape boundary, with a gradual and continuous change in environmental conditions of an ecosystem or community. Ecoclines help explain the distribution and diversity of organisms within a landscape because certain organisms survive better under certain conditions, which change along the ecocline. They contain heterogeneous communities which are considered more environmentally stable than those of ecotones
Ecological processes	ecosystems work because they are kept "alive" by ecological processes such as pollination, nutrient cycling, disturbance (e.g. fire), migration of species or soil maintenance. ○ In all areas where spatial components of ecological processes occur, loss or degradation of natural habitat should be avoided, to ensure that the ecological processes concerned continue to function. ○ Ecological processes typically only function well where natural vegetation remains, and in particular where the remaining vegetation is well-connected with other nearby patches of natural vegetation. Loss and fragmentation of natural habitat severely threatens the integrity of ecological processes. Where basic processes are intact, ecosystems are likely to recover more easily from disturbances or inappropriate actions if the actions themselves are not permanent. Conversely, the more interference there has been with basic processes, the greater the severity (and longevity) of effects. Natural processes are complex and interdependent, and it is not possible to predict all the consequences of loss of biodiversity or ecosystem integrity. When a region's natural or historic level of diversity and integrity is maintained, higher levels of system productivity are supported in the long run and the overall effects of disturbances may be dampened. ○ Other examples of processes include plant-herbivore processes, diversification of plant lineages along soil type transitions and lowland to upland gradients, natural fire regimes, predator-prey relationships, migration and exchange between inland and coastal biota (often along river corridors), faunal seasonal migration and hydrologic regimes.
Ecosystem	All of the organisms of a particular habitat, such as a lake or forest, together with the physical environment in which they live
Ecosystem status	ecosystem status of terrestrial ecosystems is based on the degree of habitat loss that has occurred in each ecosystem, relative to two thresholds: one for maintaining healthy ecosystem functioning, and one for conserving the majority of species associated with the ecosystem. As natural habitat is lost in an ecosystem, its functioning is increasingly compromised, leading eventually to the collapse of the ecosystem and to loss of species associated with that ecosystem. See Critically Endangered, Endangered, Vulnerable, Least Threatened.

Ecotone	the transitional zone between two communities. Ecotones can arise naturally, such as a lakeshore, or can be human-created, such as a cleared agricultural field from a forest. The ecotonal community retains characteristics of each bordering community and often contains species not found in the adjacent communities. Classic examples of ecotones include fencerows; forest to marshlands transitions; forest to grassland transitions; or land-water interfaces such as riparian zones in forests. Characteristics of ecotones include vegetational sharpness, physiognomic change, and occurrence of a spatial community mosaic, many exotic species, ecotonal species, spatial mass effect, and species richness higher or lower than either side of the ecotone.
Edge	the portion of an ecosystem near its perimeter, where influences of the adjacent patches can cause an environmental difference between the interior of the patch and its edge. This edge effect includes a distinctive species composition or abundance in the outer part of the landscape patch. For example, when a landscape is a mosaic of perceptibly different types, such as a forest adjacent to a grassland, the edge is the location where the two types adjoin. In a continuous landscape, such as a forest giving way to open woodland, the exact edge location is fuzzy and is sometimes determined by a local gradient exceeding a threshold, such as the point where the tree cover falls below thirty-five percent.
Emergent trees	Trees that grow above the top of the canopy
Endangered	endangered terrestrial ecosystems have lost significant amounts (more than 60 % lost) of their original natural habitat, so their functioning is compromised.
Endemic	a plant or animal species, or a vegetation type, which is naturally restricted to a particular defined region. It is often confused with indigenous, which means 'native, occurring naturally in a defined area'.
Equivalent continuous day/night rating level ($L_{R,dn}$)	Equivalent continuous A-weighted sound pressure level ($L_{Aeq,T}$) during a reference time interval of 24 h, plus specified adjustments for tonal character, impulsiveness of the sound and the time of day; and derived from the following equation: $L_{R,dn} = 10Log\left[\left(\frac{d}{24}\right)10^{L_{Req,d}/10} + \left(\frac{24-d}{24}\right)10^{L_{Req,n}+K_n/10}\right]$ dB Where: $L_{R,dn}$ is the equivalent continuous day/night rating level; d is the number of daytime hours; $L_{Req,d}$ is the rating level for daytime; $L_{Req,n}$ is the rating level for night-time; K_n is the adjustment of 10 dB added to the night-time rating level.
Exotic	Non-indigenous; introduced from elsewhere, may also be a weed or invasive species.
Fragmentation	causes land transformation, an important current process in landscapes as more and more development occurs.
Function	refers to how each element in the landscape interacts based on its life cycle events.

Habitat	the home of a plant or animal species. Generally those features of an area inhabited by animal or plant which are essential to its survival.
Heterogeneity	A landscape with structure and pattern implies that it has spatial heterogeneity or the uneven, non-random distribution of objects across the landscape.
High-energy impulsive sound	Sound from one of the following categories of sound sources: quarry and mining explosions, sonic booms, demolition and industrial processes that use high explosives, explosive industrial circuit breakers, military ordnance (e.g. armour, artillery, mortar fire, bombs, explosive ignition of rockets and missiles), or any other explosive source where the equivalent mass of TNT exceeds 25 g, or a sound with comparable characteristics and degree of intrusiveness
Highly impulsive sound	sound from one of the following categories of sound sources: small arms fire, metal hammering, wood hammering, drop-hammer pile driver, drop forging, pneumatic hammering, pavement breaking, or metal impacts of rail yard shunting operations, or sound with comparable characteristics and degree of intrusiveness
Indigenous	Native; naturally occurring.
Infra sound	Sound which predominantly contains sound energy at frequencies below 10 Hz
Invasive	a non-indigenous plant or animal species that adversely affect the habitats it invades economically, environmentally or ecologically.
Isopleth	Lines of equal intensity
Landscape baseline	A description of the existing elements, features, characteristics, character, quality and extent of the landscape (GLVIA, 2002).
Landscape character	The distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and how this is perceived by people. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement. It creates the particular sense of place of different areas of the landscape (GLVIA, 2002).
Landscape character sensitivity	This provides an indication of the ability of a landscape to absorb change from the proposed development without changing character. A pristine landscape prized for its natural beauty, or a landscape of high cultural value will have high sensitivity to changes brought about by new developments.
Landscape impacts	Change in the elements, characteristics, character and qualities of the landscape as the result of development (GLVIA, 2002). These effects can be positive or negative, and result from removal of existing landscape elements, addition of new elements, or the alteration of existing elements.
Least threatened terrestrial ecosystems	These ecosystems have lost only a small proportion (more than 80 % remains) of their original natural habitat, and are largely intact (although they may be degraded to varying degrees, for example by invasive alien species, overgrazing, or overharvesting from the wild).
Low frequency noise	Sound which predominantly contains sound energy at frequencies below 100 Hz
m/s	Metres per second
Matrix	the "background ecological system" of a landscape with a high degree of connectivity.

Memorability	The quality of being worth remembering; "continuous change results in lack of memorability"; "true memorability of phrase"
MW	Mega Watt of electricity (1000 kilowatts)
Nature-based tourism	Tourism that involves travelling to relatively undisturbed natural areas with the specific objective of studying, admiring and enjoying the scenery, fauna and flora, either directly or in conjunction with activities such as trekking, canoeing, mountain biking, hunting and fishing (Turpie et al. 2005)
Network	an interconnected system of corridors while mosaic describes the pattern of patches, corridors and matrix that form a landscape in its entirety.
NSA	Noise Sensitive Area
Off-sets	compensation for biodiversity loss resulting from authorized changes in land use. Can include assigning stewardship or protected area status to remaining conservation-worthy land or making a financial bequest for purposes of biodiversity conservation.
Patch	a term fundamental to landscape ecology, is defined as a relatively homogeneous area that differs from its surroundings. Patches are the basic unit of the landscape that change and fluctuate, a process called patch dynamics. Patches have a definite shape and spatial configuration, and can be described compositionally by internal variables such as number of trees, number of tree species, height of trees, or other similar measurements.
Pattern	is the term for the contents and internal order of a heterogeneous area of land.
Principal representative viewpoints	Principal representative viewpoints are identified during the visual baseline desk study and field survey. They should be representative of the visual amenity of the area and include walking public footpaths and visiting areas of open public access. A comprehensive photographic record of these points supports the visual impact assessment (GLVIA, 2002)
Receptor	An element or assemblage of elements that will be directly or indirectly affected by the proposed development.
Reference time interval	Representative duration of time periods that are regarded as typical for sound exposure of the community within a period of 24 h: – Daytime: 06:00 to 22:00 – Night-time: 22:00 to 06:00
Refuge	a location of an isolated or relict population of a once widespread animal or plant species
Residual noise	Totally encompassing sound in a given situation at a given time, and usually composed of sound from many sources, both near and far, excluding the noise under investigation
Rill	A very small stream of water
Riparian	pertaining to, situated on or associated with a river bank.

River corridors	River corridors perform a number of ecological functions such as modulating streamflow, storing water, removing harmful materials from water, and providing habitat for aquatic and terrestrial plants and animals. These corridors also have vegetation and soil characteristics distinctly different from surrounding uplands and support higher levels of species diversity, species densities, and rates of biological productivity than most other landscape elements. Rivers provide for migration and exchange between inland and coastal biotas.
Sense of place	That distinctive quality that makes a particular place memorable to the visitor, which can be interpreted in terms of the visual character of the landscape. The unique quality or character of a place, whether natural, rural or urban. Relates to uniqueness, distinctiveness or strong identity (Oberholzer 2005).
Shrub	A woody plant that produces no trunk but branches from the base.
Specific noise	Component of the ambient noise which can be specifically identified by acoustical means and which may be associated with a specific source **Note:** Complaints about noise usually arise as a result of one or more specific noises.
STEP	Sub-Tropical Ecosystem Planning.
Structure	is determined by the composition, the configuration, and the proportion of different patches across the landscape.
Transformation	in ecology, transformation refers to adverse changes to biodiversity, typically habitats or ecosystems, through processes such as cultivation, forestry, drainage of wetlands, urban development or invasion by alien plants or animals. Transformation results in habitat fragmentation - the breaking up of a continuous habitat, ecosystem, or land-use type into smaller fragments.
Tributary/Drainage line	A small stream or river flowing into a larger one.
Under-story	the area of a forest which grows in the shade of the canopy. Plants in the understory consist of a mixture of seedlings and saplings of canopy trees together with understory shrubs and herbs. Young canopy trees often persist as suppressed juveniles for decades while they wait for an opening in the forest overstory, which will enable their growth into the canopy. On the other hand, understory shrubs are able to complete their life cycle in the shade of the forest canopy.
Viewer sensitivity	The assessment of the receptivity of viewer groups to the visible landscape elements and visual character and their perception of visual quality and value. The sensitivity of viewer groups depends on their activity and awareness within the affected landscape, their preferences, preconceptions and their opinions.
Viewshed	A viewshed is an area of land, water, and other environmental elements that is visible from a fixed vantage point. In digital imaging, a viewshed is a binary raster indicating the visibility of a viewpoint for an area of interest. A pixel with a value of unity indicates that the viewpoint is visible from that pixel, while a value of zero indicates that the viewpoint is not visible from the pixel.

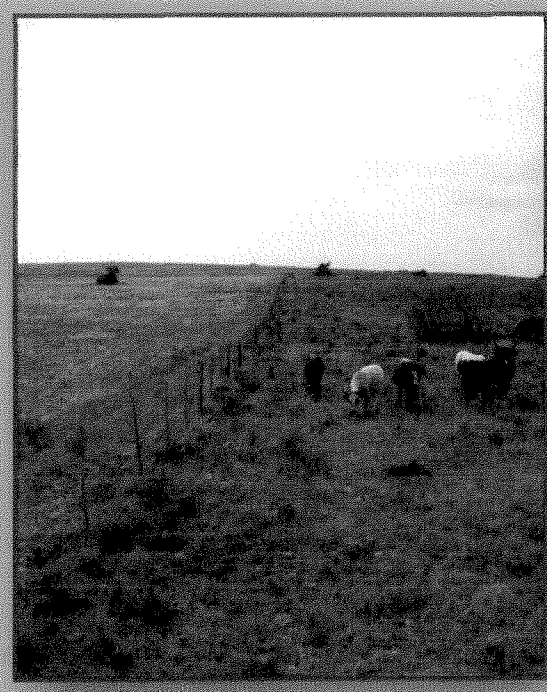
Visibility of Project	The geographic area from which the project will be visible, or view catchment area. (The actual zone of visual influence of the project may be smaller because of screening by existing trees and buildings). This also relates to the number of receptors affected (Oberholzer 2005)
Visual absorption capacity (VAC)	Visual Absorption Capacity signifies the ability of the landscape to accept additional human intervention without serious loss of character and visual quality or value. VAC is founded on the characteristics of the physical environment such as vegetative screening, diversity of colours and patterns and topographic variability. It also relates to the type of project in terms of its vertical and horizontal scale, colours and patterns. A high VAC rating implies a high ability to absorb visual impacts while a low VAC implies a low ability to absorb or conceal visual impacts.
Visual amenity	The value of a particular area or view in terms of what is seen. (GLVIA, 2002)
Visual baseline	A description of the extent and nature of existing views of the site from representative viewpoints, and the nature and characteristics of the visual amenity of the potentially sensitive visual receptors (GLVIA, 2002)
Visual envelope	The approximate extent within which the development can be seen. The extent is often limited to a distance from the development within which views of the development are expected to be of concern.
Visual exposure	Visual exposure refers to the relative visibility of a project or feature in the landscape (Oberholzer, 2005). Exposure and visual impact tend to diminish exponentially with distance.
Visual impact	Changes to the visual character of available views resulting from the development that include: obstruction of existing views; removal of screening elements thereby exposing viewers to unsightly views; the introduction of new elements into the viewshed experienced by visual receptors and intrusion of foreign elements into the viewshed of landscape features thereby detracting from the visual amenity of the area.
Visual impact assessment	A specialist study to determine the visual effects of a proposed development on the surrounding environment. The primary goal of this specialist study is to identify potential risk sources resulting from the project that may impact on the visual environment of the study area, and to assess their significance. These impacts include landscape impacts and visual impacts.
Visual intrusion	Visual intrusion indicates the level of compatibility or congruence of the project with the particular qualities of the area – its 'sense of place'. This is related to the idea of context and maintaining the integrity of the landscape (Oberholzer 2005).
Visual quality	An assessment of the aesthetic excellence of the visual resources of an area. This should not be confused with the value of these resources where an area of low visual quality may still be accorded a high value. Typical indicators used to assess visual quality are vividness, intactness and unity. For more descriptive assessments of visual quality attributes such as variety, coherence, uniqueness, harmony, and pattern can be referred to.
Visual receptors	Visual receptors include viewer groups such as the local community, residents, workers, the broader public and visitors to the area, as well as public or community areas from which the development is visible.
Visual resource	Visual resource is an encompassing term relating to the visible landscape and its recognisable elements which, through their coexistence, result in a particular landscape and visual character

Vulnerable	vulnerable terrestrial ecosystems have lost some (more than 60 % remains) of their original natural habitat, and their functioning will be compromised if they continue to lose natural habitat.
Weed	an indigenous or non-indigenous plant that grows and reproduces aggressively, usually a ruderal pioneer of disturbed areas. Weeds may be unwanted because they are unsightly, or they limit the growth of other plants by blocking light or using up nutrients from the soil. They also can harbour and spread plant pathogens.
Wetlands	a collective term used to describe lands that are sometimes or always covered by shallow water or have saturated soils, and where plants adapted for life in wet conditions usually grow. ○ Collectively, wetlands and their associated vegetation are highly diverse and productive ecosystems. Despite their invaluable social and environmental roles, wetlands have been identified as being among southern Africa's most threatened and neglected habitats. ○ Wetlands perform a number of valuable ecosystem functions, relating to: ▪ Water quality (biofiltration, sediment trapping, protecting shorelines and controlling erosion, aquifer recharge), ▪ Water quantity (reducing peak floods and storing flood waters, supporting stream base flow, groundwater discharge/recharge), and ▪ Habitat for insects, amphibians, birds, fish and mammals for all or portions of their life cycles.
WTG	Wind Turbine Generator
Zone of Theoretical Visibility (ZVT)	The area over which a development can theoretically be seen (also known as a Zone of Visual Influence, visual envelope and viewshed). (Horner, MacLennan and Envision 2006)
Zone of visual influence (ZVI)	The extent of the area from which the most elevated structures of the proposed development could be seen and may be considered to be of interest (see visual envelope or viewshed).

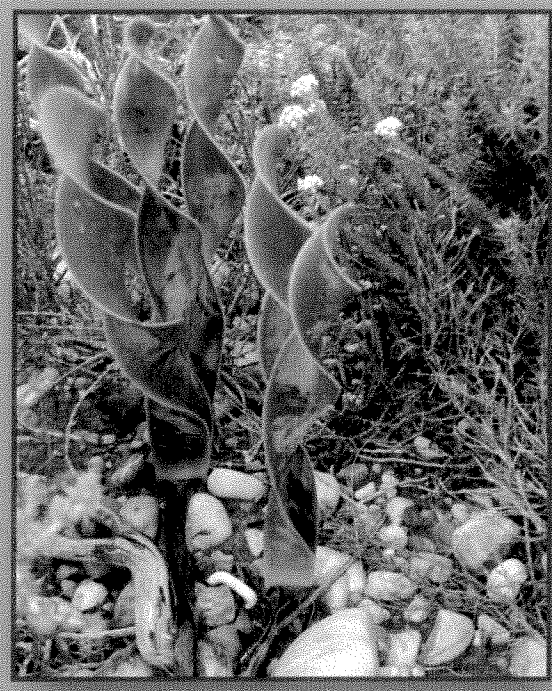
Environmental Impact Assessment for the proposed Ubuntu Wind Energy Project near Jeffrey's Bay, Eastern Cape: Draft Environmental Impact Assessment Report

SECTION A:

Draft Environmental Impact Assessment Report



Chapter 1: Introduction



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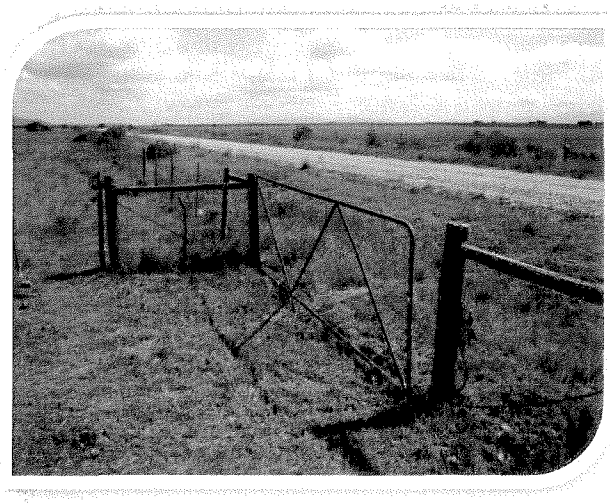

CHAPTER 1. INTRODUCTION

1.1 BACKGROUND

WKN-Windcurrent SA (Pty) Ltd (referred to as "WKN-Windcurrent") is proposing the construction of a 100 MW wind energy facility on the Farms Zuurbron and Vlakteplaas near Jeffrey's Bay in the Kouga Municipal area, Eastern Cape Province. The proposed project is referred to as the Ubuntu Wind Energy Project.

The proposed Ubuntu project will be located on the farms Zuurbron and Vlakteplaas in the Kouga Municipality approximately 4 km to 7 km north north west of the town of Jeffrey's Bay as follows (see locality maps in Figures 1.1):

- Remainder of Farm 830, Kransplaas, (Farm Zuurbron);
- Portions 2/3/4/5/6/7 of Farm 854 (Farm Vlakteplaas);
- Farms 307/5; Div Humansdorp;
- 307/6; Div Humansdorp;
- 307/7 Div Humansdorp; and
- Farm 845, Div Humansdorp.

The proposed project will be undertaken in two phases, both of which are covered in this EIA:

- Phase 1 (2013): Installed capacity up to 50 MW
- Phase 2 (2013): Additional installed capacity of up to 50 MW, bringing the total installed capacity up to 100 MW.

Phase 1 will have a total capacity of up to 50 MW, which can readily accommodated by the existing transmission infrastructure without the need for any upgrades and would consist of up to a maximum of 25 turbines.

Phase 2 consists of additional turbines, identical to the turbines used in the Phase 1, to bring the total capacity of the wind farm from both phases up to 100 MW. The capacity of the turbines that are considered ranges from 2 MW to 3 MW. The total number of turbines could therefore vary from 33 turbines of 3 MW to 50 turbines if a 2 MW turbine is used.

The existing 132 kV overhead transmission line will be used to connect between the wind farm and the transmission system (Eskom grid). A new 132 kV substation will be built on site to connect to the existing 132 kV transmission line.

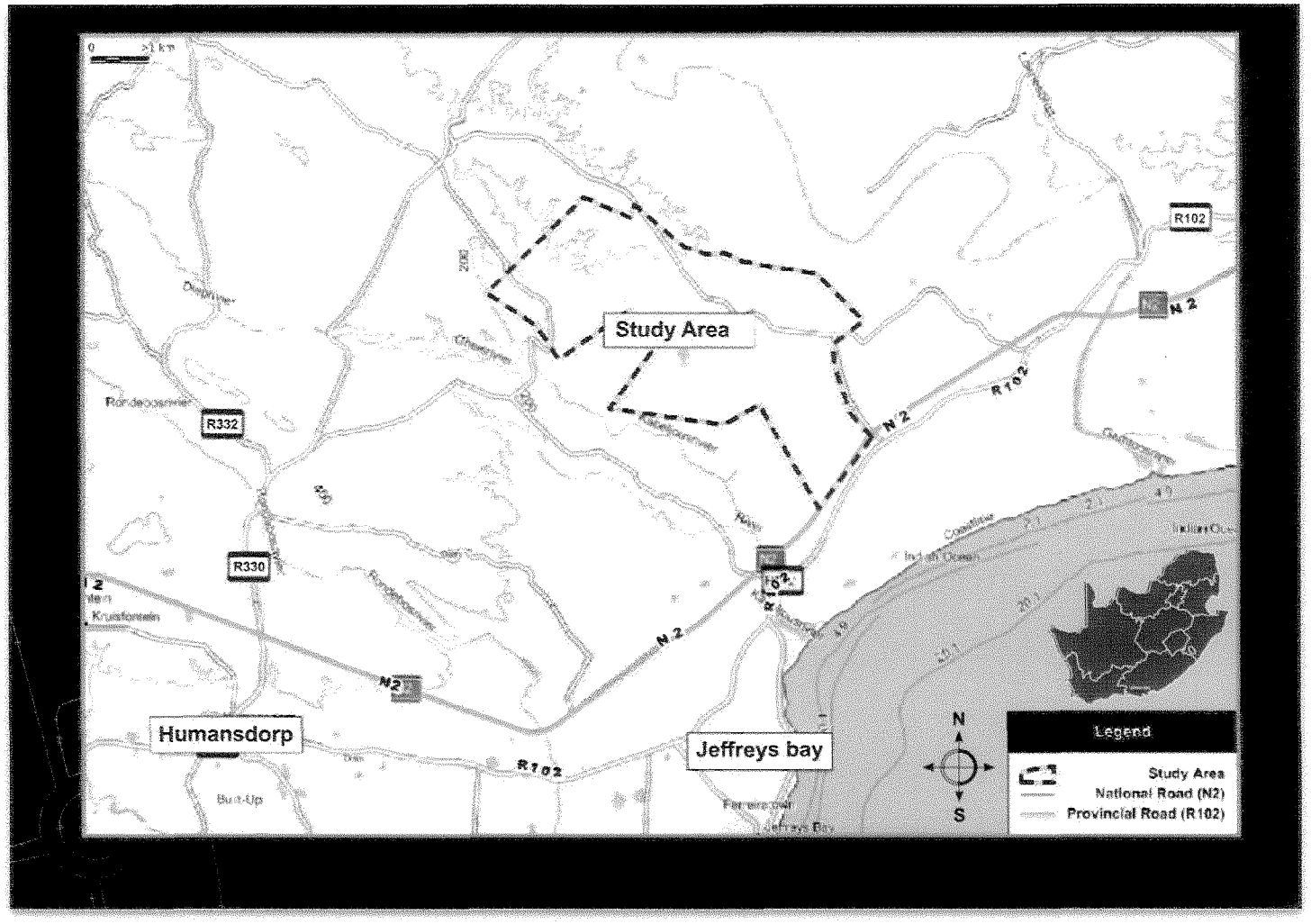

Figure 1.1a: Locality map of the proposed Ubuntu Wind Energy Project near Jeffrey's Bay in the Eastern Cape

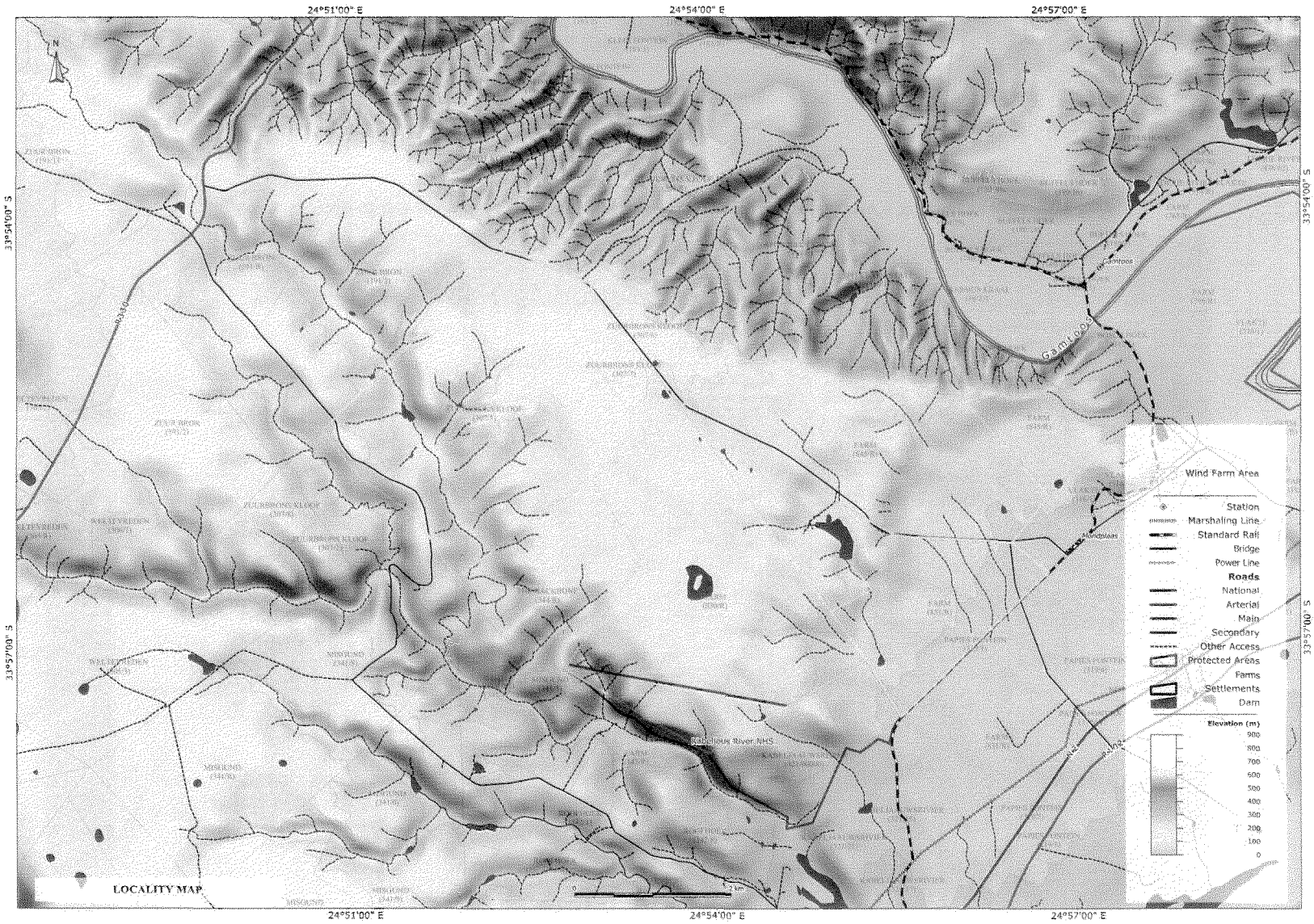

Figure 1.1b: Locality map of the proposed Ubuntu Wind Energy Project near Jeffrey's Bay in the Eastern Cape

A separate Basic Assessment (Department of Environmental Affairs Reference number: 12/12/20/1753) was undertaken from January to June 2010 for the establishment of a wind monitoring mast on Farm Zuurbron prior to the development of the wind farm. This application was undertaken under the NEMA EIA Regulations published in GN R 385, 386 and 387 on 21 April 2006. Subsequently Amended NEMA EIA Regulations (Notices GN R. 543, 544, 545, and 546) were published in the Government Gazette No. 33306 of 18 June 2010, and came into effect from 2 August 2010 (referred to as the 2010 EIA Regulations). A wind monitoring mast is no longer a listed activity in terms of the 2010 EIA Regulations. The monitoring mast has subsequently been erected and is 80 m high.

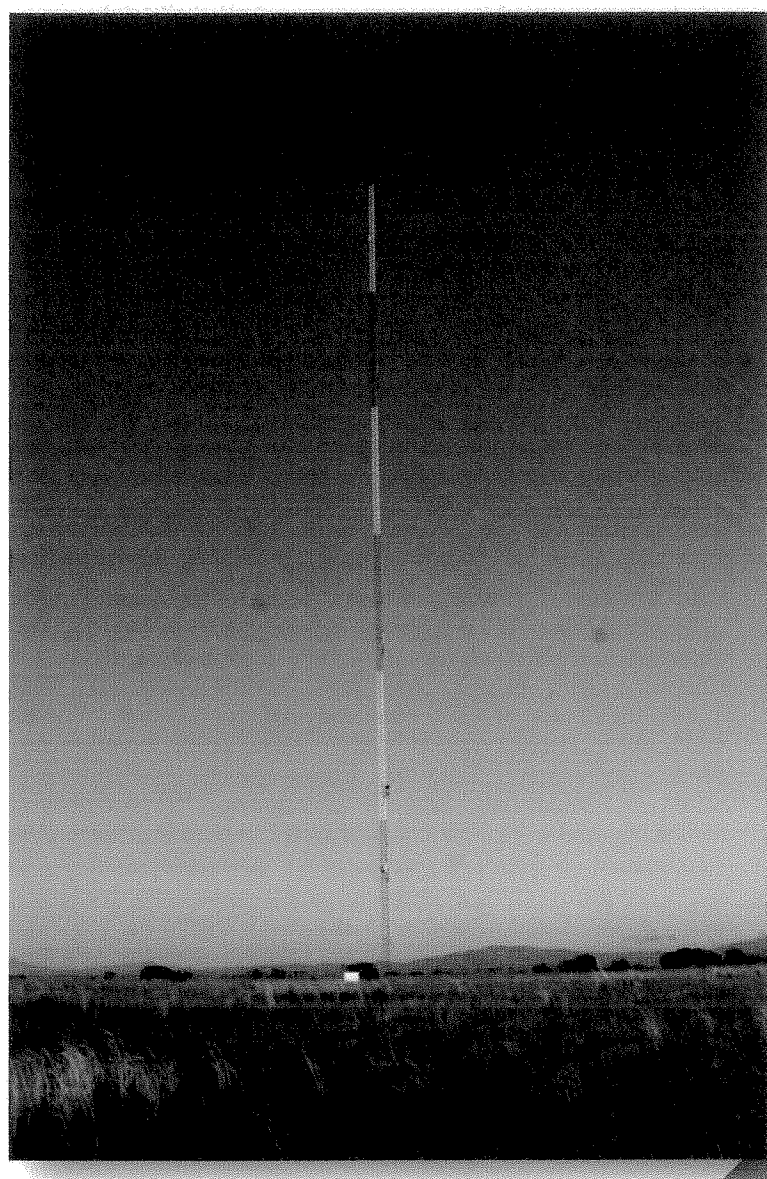

Figure 1.2: Wind monitoring mast (80 m high) on Farm Zuurbron

1.2 ABOUT THE PROJECT PROPONENT

WKN Windkraft Nord AG (WKN) was founded in 1990 and is one of the pioneers of the German wind energy market. WKN has international experience in development, financing, erection and operation of wind farms, and has, as of 2010, a realised capacity of 1052.3 MW wind power. Windcurrent SA (Pty) Ltd is a local company which has been developing renewable energy projects since 2009 in South Africa. The Joint Venture Company which was formed is a South African based renewable energy company that develops, builds and operates renewable energy projects.

1.3 NEED AND JUSTIFICATION FOR THE PROJECT

The aim of this project is to generate electricity that will be fed into the national or the provincial grid by erecting a wind farm of 100 MW. In mid-2011, the South African government indicated a change in pricing strategy for renewable energy. Instead of applying a predetermined renewable-energy feed-in tariff (Refit), as previously indicated, the government would conduct a selection process that would involve both price and non-price elements. This requires bidders to propose their price per MWh for the energy output to be generated, along with full or partial inflation indexation. The price indication would be for the first 20 years of operation, or for the duration of the power purchase agreement (PPA). On 3 August 2011, the Department of Energy (DoE) released the qualification and proposal documentation for South Africa's first renewable energy independent power producer (IPP) tender process, and announced that it has allocated a total of 3 725 MW capacity across various renewables technologies, with 1 850 MW set aside for onshore wind, 200 MW for concentrated solar thermal, a further 1 450 MW for solar photovoltaic solutions, 12.5 MW for both biomass and biogas, 25 MW for landfill gas capacity, 75 MW for small hydro, and a further 100 MW for small-scale IPP projects of less than 5 MW. This allocation to wind energy is an increase on the 1 025 MW set out for the first procurement round in the Integrated Resource Plan (IRP) 2010-2030 (Source: Engineering News, 4 & 5 August 2011).

At a national scale, renewable energy (in particular, wind energy) has the potential to play an important role in meeting South Africa's energy demand through diversifying the sources of power generation whilst reducing the country's carbon footprint from power generation. Currently, approximately 93% of South Africa's power generation is derived from coal. The proposed Ubuntu project of 100 MW could offset over 200 000 tonnes of CO_2 per year, or 4 000 000 tonnes of CO_2 over the lifetime (20 years) of the project[1],[2]. Wind farms have a relatively short construction lead time and could therefore be quickly developed to meet South Africa's power need. Coal fired power stations used approximately 292 million cubic metres of water, or 1.5% of national water consumption, for electricity generation during 2005. The future availability and treatment costs of water therefore present a serious challenge for the economic sustainability of South Africa's current (coal-based) electricity supply.

The Eastern Cape Province is reliant on electricity imports from other provinces yet houses significant industrial and rural development potential. Power from the national grid is largely generated from coal power stations, and transmitted considerable distances to the Eastern Cape (e.g. from Mpumalanga). This leads to significant transmission losses and local grid instabilities. Electricity supply to the Eastern Cape Province is further constrained by transmission

[1] http://www.iea.org/co2highlights/
[2] http://www.sunearthtools.com/dp/tools/CO2-emissions-calculator.php?lang=de#txtCO2_3

infrastructure. Eskom currently supplies approximately 1 400 MW of electricity to the Eastern Cape Province.

Against the background of international commitments to generation of "green energy" with low or zero CO_2 emissions, the intention of this project is to generate additional electricity that will be fed into the national grid by installing a wind farm with a capacity of 100 MW. The objective of the WKN-Windcurrent project is to support the growing demand for electricity by means of renewable energy and to lower the emissions of carbon dioxide (CO_2) into the atmosphere. Electricity generated by wind energy, that replaces the use of fossil fuels, results in greenhouse gas emission reductions. Wind energy is a national imperative. A constrained national energy supply and South Africa's commitments to meeting its 2013 CO_2 reduction target and to the Kyoto Protocol require the rapid deployment of renewable energy, of which wind power has the greatest commercial potential.

The **Integrated Resource Plan for Electricity** (IRP)[3] for South Africa is a subset of the **Integrated Energy Plan** (IEP) for the Republic of South Africa which was published on 19 March 2003. Its Draft Executive Summary and **Medium Term Risk Mitigation Plan**[4] were published by the Department of Energy on 8 October 2010. The objective for the IRP is to develop a sustainable electricity investment strategy for generation and transmission of electricity in South Africa for the next 25 years. After public participation during November/December 2010, the IRP was revised and released as the Policy-Adjusted IRP on 28 March 2011 by the Department of Energy.

At a provincial level, the project aims to assist the Eastern Cape in achieving improved energy stability and security. The local wind climate in the Humansdorp region creates the potential for a wind energy project to generate electricity, thereby contributing towards the provision of sustainable renewable energy.

Further information on **energy planning and strategic initiatives** in South Africa, and the consequent need for the development of wind energy projects, is provided in Section 1.7. Further information on the **objectives** of the proposed project is provided in Section 2.3.

1.4 REQUIREMENTS FOR AN ENVIRONMENTAL IMPACT ASSESSMENT

In terms of the regulations promulgated under Chapter 5 of the National Environmental Management Act (Act 107 of 1998) ("NEMA") published in GN R 385, 386 and 387 on 21 April 2006, Scoping and Environmental Impact Assessment (EIA) is required for this project. The need for Scoping and EIA is triggered by, amongst others, the inclusion of activities listed in GN R 387, in particular:

[3] *Executive Summary of the Draft Integrated Electricity Resource Plan for South Africa - 2010 to 2030.* Available online: http://www.doe-irp.co.za/content/Executive Summary Draft IRP2010 8Oct2010.pdf. Department of Energy. Accessed 1 December 2010.

[4] *Medium Term Risk Mitigation Plan (MTRM) for Electricity in South Africa - 2010 to 2016.* http://www.doe-irp.co.za/content/Medium Term Risk Mitigation Project Phase 1.pdf. Department of Energy. Accessed 1 December 2010.

1) The construction of facilities or infrastructure, including associated structures or infrastructure, for –

(a) the generation of electricity where -

(i) the electricity output is 20 megawatts or more; or

(ii) the elements of the facility cover a combined area in excess of 1 hectare.

Chapter 4 of this Draft EIA Report contains a list of activities contained in GN R 386 and GN R 387 that are triggered by the various project components and form part of this Scoping and Environmental Impact Assessment process. These listed activities require authorisation from the National Department of Environmental Affairs (DEA). The environmental assessment needs to show the responsible authority, DEA, and the project proponent, WKN-Windcurrent, what the consequences of their choices will be in terms of impacts on the biophysical and socio-economic environment and how such impacts can be managed.

It is noted that **Amended NEMA EIA Regulations** (Notices GN R. 543, 544, 545, and 546) were published in the Government Gazette No. 33306 of 18 June 2010, and came into effect from 2 August 2010 (referred to as the ***2010 EIA Regulations***). This EIA application by WKN-Windcurrent was initiated in December 2009, prior to the enactment of the Amended Regulations, and will therefore be dealt with in terms of GN R 385, 386 and 387. However, in line with Regulation 76 (3) of the Amended EIA Regulations regarding transitional arrangements, any impacts associated with listed activities which are included in the Amended listing notices, which were not listed under the listing notices GN R386 and 387, would need to be assessed as part of this EIA process. CSIR has therefore checked the new listed activities and have included the ones relevant to this project in Table 4.1 of Chapter 4.

1.5 EIA TEAM

The CSIR has been appointed by WKN-Windcurrent to undertake the EIA required for this project.

The EIA team involved in this EIA is listed in Table 1.1. Most of the specialists are familiar with the area and have been involved in other specialist studies in the area.

1.6 DETAILS AND EXPERTISE OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)

The EIA Project Team is being led by Paul Lochner, who has 16 years experience in environmental assessment and management studies, primarily in the leadership and integration functions (refer to Appendix A for his CV). This has included Strategic Environmental Assessments (SEAs), Environmental Impact Assessments (EIAs) and Environmental Management Plans (EMPs). He has been a certified Environmental Assessment Practitioner for South Africa (EAPSA) since July 2003; and has conducted several EIA processes both in South Africa and internationally. Examples of EIAs include the EIA for the 180 MW Jeffreys Bay Wind Project proposed by Mainstream, EIA for the BioTherm wind energy project near Swellendam, EIA for the InnoWind wind energy projects in the Western Cape, EIA for the Electrawinds wind energy project at Coega in the Eastern Cape, Coega Aluminium Smelter EIA, EIA for the expansion of the container terminal and construction of an administration craft harbour at the Port of Ngqura, Thesen Island EIA at Knysna, Century City Wetlands EIA in Cape Town, and ESIA for a proposed alumina refinery at Sosnogorsk in the Komi Republic of Russia. He has also

prepared various EMPs, such as the EMP for the Rietvlei Wetland Reserve (Cape Town), EMP for Century City wetlands in Cape Town, EMP for Eskom Wind Energy Project (Klipheuwel near Stellenbosch in the Western Cape) and the EMP for the Coega Aluminium Smelter. He has authored several Guidelines, such as the "Overview of Integrated Environmental Management" information document for DEAT in 2004; and the "Guideline for EMPs" published in 2005 by the Western Cape government.

Paul will be supported by a CSIR Project Manager, Minnelise Levendal (refer to Appendix A for her CV). Minnelise managed the Basic Assessment Process for the national Department of Energy for the erection of 10 wind monitoring masts as part of the national wind atlas project. From 2009 until 2010 she was also part of the Project Implementation Team for South Africa's Second National Communication (SNC) in terms of climate change. SA needs to report on meeting its obligations specified in the Kyoto Protocol. This process was led by the South African Botanical Institute (SANBI), and the CSIR has been appointed by SANBI to manage the process. Minnelise is currently managing the BioTherm wind energy project near Swellendam. She has also conducted a number of Basic Assessments for the erection of wind monitoring masts.

Table 1.1: EIA Team

EIA Management Team		
Paul Lochner	CSIR	**Project Leader (EAP-SA)**
Minnelise Levendal	CSIR	**Project Manager**
Specialist Team		
Jamie Pote	Private Consultant	**Ecology (Flora and Fauna)**
Chris van Rooyen	Chris van Rooyen Consultants	**Avifauna (birds)**
Stephanie Dippenaar **Anna Doty**	Private Consultant Nelson Mandela Metro University	**Bats**
Henry Holland	Mapthis	**Visual impacts**
Brett Williams	SafeTech	**Noise**
Dr Hugo van Zyl	Independent Economic Researchers	**Economics**
Dr Johan Binneman	Albany Museum	**Archaeology**
Dr John Almond	NaturaViva	**Palaeontology**
Public Participation Process		
Sandy Wren	**Public Process Consultants**	**Public Participation Process**

1.7 OBJECTIVES OF THE DRAFT AND FINAL EIA REPORTS

This Draft EIA Report was preceded by a comprehensive scoping process that led to the submission of a Final Scoping Report (and Plan of study for the EIA) to DEA for approval on 8 April 2011. Approval dated 7 July 2011 was received which marked the end of the Scoping phase (Appendix B), after which the EIA process moved into the impact assessment and reporting phase. For background on the scoping process, the reader is referred to the Final Scoping Report for the proposed Ubuntu wind energy project (CSIR, 2010).

The primary objective of this EIA Report is to present the competent authority, DEA, with an overview of the predicted impacts and associated management actions required to avoid or mitigate the negative impacts; or to enhance the benefits of the proposed project.

In terms of legal requirements, a crucial objective of the EIA Report is to satisfy the requirements of Sections 32, 33 and 34 of the NEMA 2006 EIA Regulations. These sections regulate and prescribe the content of the EIA Report and specify the type of supporting information that must accompany the submission of the report to the authorities. An overview of where the requirements are addressed in this report is presented in Table 1.2.

Furthermore, this process is designed to satisfy the requirements of Regulations 57, 58 and 59 of the NEMA 2006 EIA Regulations relating to the public participation process and, specifically, the registration of I&APs and recording of submissions from interested and affected parties. All I&APs on the current database for this EIA (Appendix C) will be informed of the release of the draft EIA Report for comment. All comments received will be recorded and addressed in the Final EIA Report.

The **draft Environmental Management Plan** (EMP) required as part of the EIA process is provided in **Part B** of this EIA Report.

Table 1.2: Summary of where requirements of an Environmental Impact Assessment Report (in terms of Sections 32(2), 33 and 34 of the NEMA 2006 EIA Regulations) are provided in this EIA Report

Section	Requirement for EIA Report	Where this is provided in this EIA Report
(2) (a) (i)	The EAP who compiled the report	Chapter 1, Appendix A
(2) (a) (ii)	The expertise of the EAP to carry out an environmental impact assessment	Chapter 1, Appendix A
(2) (b)	A detailed description of the proposed activity	Chapter 2
(2) (c)	A description of the property on which the activity is to be undertaken and the location of the activity on the property	Chapter 3 (overview), with more detail in Chapters 5 to 12
(2) (c) (i)	A linear activity, a description of the route of the activity	Not applicable
(2) (c) (ii)	An ocean-based activity, the coordinates where the activity is to be undertaken	Not applicable
(2) (d)	A description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity	Chapter 3 (overview), with more detail in Chapters 5 to 12
(2) (e)	Details of the public participation process conducted in terms of sub-regulation	Chapter 4
(2) (e) (i)	Steps undertaken in accordance with the plan of study	Chapter 4
(2) (e) (ii)	A list of persons, organisations and organs of state that were registered as interested and affected parties	Appendix C
(2) (e) (iii)	A summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments	Refer to Final Scoping Report for comments from scoping phase. Comments on the Draft EIA Report will be included in the Final EIA Report.
(2) (e) (iv)	Copies of any representation, objections and comments received from registered interested and affected parties	To be included in the Final EIA Report.
(2) (f)	A description of the need and desirability of the proposed activity and identified potential alternatives to the proposed activity including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity	Chapters 1 and 4

Section	Requirement for EIA Report	Where this is provided in this EIA Report
(2) (g)	An indication of the methodology used in determining the significance of potential environmental impacts	**Chapter 4**
(2) (h)	A description and comparative assessment of all alternatives identified during the environmental impact assessment process	**Chapter 4**
(2) (i)	A summary of the findings and recommendations of any specialist report or report on a specialised process	**Summary**
(2) (j)	A description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures	**Chapters 5 to 12**
(2) (k)	An assessment of each identified potentially significant impact	**Chapters 5 to 12, Part B (EMP)**
(2) (k) (i)	Cumulative impacts	**Chapters 5 to 12, Part B**
(2) (k) (ii)	The nature of the impact	**Chapters 5 to 12, Part B**
(2) (k) (iii)	The extent and duration of the impact	**Chapters 5 to 12, Part B**
(2) (k) (iv)	The probability of the impact occurring	**Chapters 5 to 12, Part B**
(2) (k) (v)	The degree to which the impact can be reversed	**Chapters 5 to 12, Part B**
(2) (k) (vi)	The degree to which the impact may cause irreplaceable loss of resources	**Chapters 5 to 12, Part B**
(2) (k) (vii)	The degree to which the impact can be mitigated	**Chapters 5 to 12, Part B**
(2) (l)	A description of any assumptions, uncertainties and gaps in knowledge	**Chapter 1 and Chapters 5 to 12 (for specialist studies)**
(2) (m))	An opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation	**Chapter 14 (Conclusions and Recommendations)**
(2) (n) (i)	A summary of the key findings of the environmental impact assessment	**Chapter 14, Executive Summary**
(2) (n) (ii)	A comparative assessment of the positive and negative implications of the proposed activity	**Chapter 14 (Conclusions and Recommendations)**
(2) (o)	A draft Environmental management plan that complies with regulation 35	**Part B (EMP)**
(2) (p)	**Copies of any specialist reports and reports on specialised processes complying with regulation 33**	**Integrated into Chapters 5 to 13**

1.8 ENERGY PLANNING CONTEXT AND STRATEGIC INITIATIVES FOR SOUTH AFRICA

1.8.1 Current energy context: coal-based power generation

South Africa has an energy intensive economy, highly reliant on fossil fuels, and regards economic growth based on energy intensive industries as a key means to development. Eskom plays a central role in energy generation in South Africa, producing 95% of its total power. Currently Eskom has a total installed generating capacity of some 42 000 MW (net 36 200 MW, peak 34 200 MW) with new peak capacity in demand since 2007. Approximately 93% of its power production capacity is coal-based, 5% nuclear and 2% hydro-electric. Several small power stations and back-up gas-turbines represent less than 1% of the national output, and another 3% is used for own consumption by independent power producers.

Coal, though currently appearing to be cheaper per kWh than renewable energy sources, introduces a host of so-called externality costs which are not factored into its monetary value. These costs arise across the lifecycle of coal consumption, from extraction to disposal (also known as the chain of custody) and can cause irreparable environmental damage, such as deforestation, land erosion and the emission of greenhouse gasses due to underground coal fires. One of the most insidious impacts of coal mining is acid mine drainage containing carcinogens such as benzene and toluene, which drain from mines into surface and ground water sources. Coal burning releases oxides of sulphur and nitrogen as well as mercury into the atmosphere, which cause adverse impacts on the natural environment (e.g. acid rain).

A wind energy project, such as the proposed Ubuntu wind energy project aims to generate, at full capacity 100 MW of electricity with zero atmospheric emissions.

1.8.2 Policy context for promotion of renewable energy

A substantive body of policy and legislation (at international, national and provincial levels) supports the development of renewable energy in South Africa, for example:

- Kyoto Protocol
- The Constitution of the Republic of South Africa (Act 108 of 1996)
- White Paper on the Energy Policy of South Africa (December 1998)
- National Integrated Energy Plan for the RSA (March 2003)
- White Paper on Renewable Energy (November 2003)
- DME Energy Efficiency Strategy (March 2005)
- National Environmental Management Act (No. 107 of 1998) (NEMA)
- National Environmental Management: Air Quality Act
- National Strategy for Sustainable Development (DEAT, 2006)
- The Long term mitigation scenarios of the Department of Environmental Affairs (2008)
- Electricity Regulations Amendments (August, 2009)
- Renewable Energy Feed in Tariff Guidelines (NERSA, March 2009).

1.8.3 Integrated Strategic Energy Planning for South Africa

Integrated Strategic Electricity Planning is the way in which Eskom assesses by how much the demand for electricity is likely to grow and how best to meet and manage that demand. The most likely future, based on long-term southern African economic scenarios, is forecasted and provides the framework for Eskom to investigate a wide range of new supply-side and demand-side technologies and options. Nationally the Department of Energy is embarking on an Integrated Resource Planning process to develop a country energy plan for the next 20 years of which renewable energy will form part of the proposed energy mix. The demand for electricity is growing continuously and is projected to continue growing in the foreseeable future (as shown in Figure 1.3, which includes three growth scenarios).

Considering the economic development of South Africa an additional 40 000 MW production capacity has been planned by Eskom over the next 20 years due mainly to upcoming large mining and metal industry. Therefore by 2020, South Africa will need several new sources of power to provide for the growing demand (see Figure 1.3). In order to meet this future demand, Eskom is actively investigating and installing new energy-generating facilities.

Environmental Impact Assessment for the proposed Ubuntu Wind Energy Project near Jeffrey's Bay, Eastern Cape: Draft Environmental Impact Assessment Report

Chapter 2: Project Description

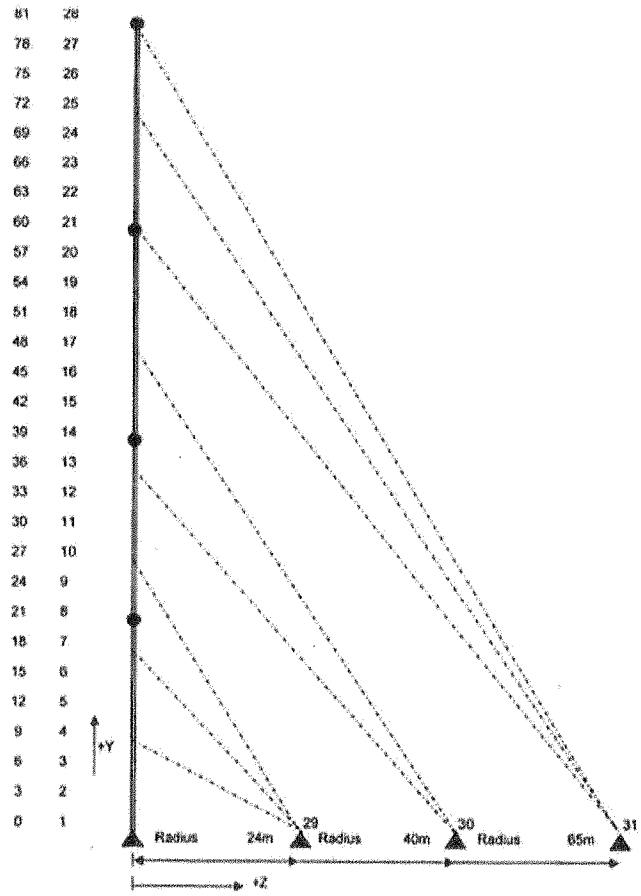

Figure 2.2: Example of the 80 m wind monitoring mast erected on Farm Zuurbron

Wind turbines

1. 33 to 50 turbines (the actual number will be dependent on the capacity of the turbines selected in the range between 2 and 3 MW), with an expected hub height from 80 m to 105 m and a blade diameter from 90 m to 112 m.
2. Turbines will be supported on foundations dimensioned to the geotechnical properties, for example reinforced concrete spread foundations of approximately 20 m by 20 m and 3 m in depth.
3. Electrical transformers will be placed beside or in (the nacelle) of each turbine.
4. Hard standing areas will be established adjacent to each turbine for use by cranes during construction and retained for maintenance use throughout life span of the project.
5. A maximum of three additional wind monitoring masts of up to 100 m in height may be installed.
6. Gravel roads, approximately 5 m wide, will be necessary to provide access to each turbine site, with the intent being to upgrade existing roads as far as possible.

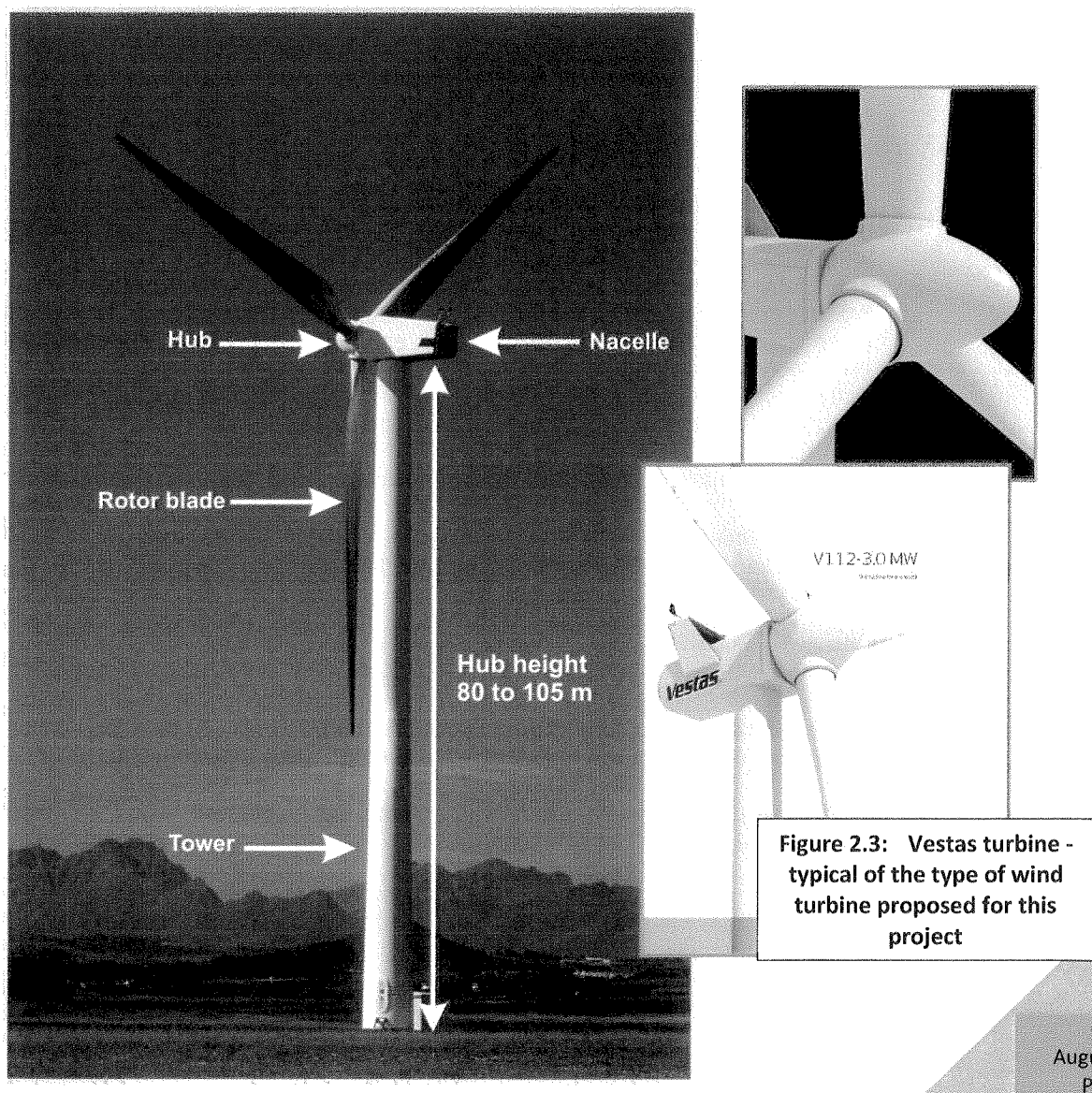

Figure 2.3: Vestas turbine - typical of the type of wind turbine proposed for this project

Electrical connections

1. The wind turbines will be typically connected to each other and to the substation using medium voltage cables which will, in most cases, be buried approximately 1 m below ground, except where a technical assessment of the proposed design suggests that above ground lines are appropriate.
2. A new sub-station and transformer to the 132 kV Eskom grid will be constructed on Farm Vlakteplaas. The substation will preferably be located close to the 132 kV line.
3. The connection from the substation to the Eskom grid line is a stretch of over head line supported on an intermediate pole(s), depending on the location of the substation relative to the 132 kV line.

Other infrastructure

1. Operations and maintenance building: A single storey building, maximum 5000 m^2, with warehouse / workshop space and access, office and telecoms space and security and ablution facilities as required. This preferably should be situated preferably close to the substation.
2. Fencing as required.

Temporary activities during construction

1. A lay down area is necessary for the assembly of the turbine components, beside an access route, of maximum area 10,000 m^2 – this hard standing area could be temporary or if the landowner prefers, left for long-term use.
2. The overall site compound for all contractors would be a maximum of 5000 m^2.
3. Existing borrow pits will be used as far as possible for road upgrades. The size of these pits will be dependent on the terrain and need for granular fill material for use in construction.
4. At the end of construction these borrow pits will be backfilled as much as possible using surplus excavated material from the foundations.

The construction will be undertaken in three distinct components:

- Civil construction;
- Electrical installation and wind turbine erection; and
- Commissioning.

The construction and commissioning phases are expected to require a total period of 8 to 15 months.

The operational life span of the wind turbines is expected to be 20 years. Turbine life can be extended beyond 20 years through regular maintenance and/or upgrades in technology.

The final choice of the type of turbines will be based on ease of erection, availability and suitability to the wind regime, amongst other criteria.

Wind turbines can be operated in parallel with farming activities. Internationally it is common practice for farming to continue whilst wind turbines are in operation leading to greater efficiency of land use and no loss of economic activity, but an added passive income for the landowner. Internationally, wind turbines and related components take up between 2% and 5% of the surface area of the wind farm, allowing other activities such as farming to continue on the land.

Farms Zuurbron and Vlakteplaas have a combined area of approximately 4 200 ha. The proposed wind turbines will be situated on the northern half of Vlakteplaas and eastern half of Zuurbron. After construction, the turbine mast footprints (including new roads, hard standing areas for cranes and turbine foundations) will cover approximately 15 ha which comprises approximately 0.36% of the total area.

Chapter 3: Description of the Affected Environment

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CHAPTER 3. DESCRIPTION OF THE AFFECTED ENVIRONMENT

This section of the Draft EIA Report provides a description of the environment that may be affected by the proposed Ubuntu wind energy project approximately 3 kilometres north-east of Jeffrey's Bay along the eastern side of the Kabeljous River in the Eastern Cape Province. This information is provided in order to assist the reader in understanding the possible effects of the proposed project on the environment. Wind energy projects can extend over a large area as the distance between each turbine is approximately 500m. However, each turbine foundation is approximately 20m by 20m and with associated access roads and electrical substation it is unlikely that the wind energy project will affect more than 1% of the area it occupies although it will be visible in the area surrounding the wind farm. Aspects of the biophysical, social and economic environment that could directly or indirectly be affected by, or could affect, the proposed development have been described. The information presented in this chapter has been drawn primarily from the specialist studies commissioned for the EIA as well as from existing information available for the area and pre-existing field data, and aims to provide the context within which this EIA is being conducted.

The main objective of this chapter is to provide an overview of the region in which the proposed wind farm will be located, key environmental features are highlighted however these will be addressed in greater detail in the specialist studies included in this report.

3.1 SITE LOCALITY

The proposed Ubuntu wind energy project would be situated on a coastal plateau approximately 120 m to 200 m above sea level, inland of the N2 national road (see site locality maps in Figure 1.1 in Chapter 1 of this report). The landscape is relatively flat, high lying agricultural lands sloping steeply to the west and south-west towards the Kabeljous River. The facility will extend over two farms, Farms Zuurbron and Vlakteplaas. The farm Zuurbron extends from approximately 6 to 15 km from the coast; and the farm Vlakteplaas extends from approximately 4 to 6 km from the coast, with the southern border of the latter farm being on the N2.

These farms have a combined area of approximately 4 200 ha. Wind turbines will be situated on the northern half of Vlakteplaas and eastern half of Zuurbron. After construction, the turbine mast footprints (including new roads, hard standing areas for cranes and turbine foundations) will cover approximately 15 ha which comprises 0.36% of the total area.

3.2 BIOPHYSICAL ENVIRONMENT

3.2.1 Climate

Rainfall in the Kouga region is bimodal where both summer and winter rainfall occurs, a feature typical of the south-east coastal region of the country. The mean annual rainfall is approximately 400 mm. The weather is mild without extreme conditions with an average summer temperature of 24°C and a winter temperature of 17°C. During winter the prevailing wind is from a westerly to

south westerly direction and during summer the wind is predominantly easterly. A high frequency of wind occurs daily in the area.

3.2.2 Landscape and Geology

Dairy and stock farming is the main land use type in the surrounding region. The Gamtoos River floodplain is under intensive irrigated cultivation. Settlements such as Hankey and Humansdorp have developed as service centres for the agricultural industry. Humansdorp lies to the west of the site. Towns and villages along the coast are holiday resorts with seasonal variations in population. Jeffrey's Bay is the largest of these and is rapidly expanding with light and medium industrial sectors. Other holiday resorts that potentially will be affected by the wind farm include Aston Bay, Paradise Beach and St Francis Bay.

There are various power line, road and railway networks covering the area. A 132 kV power line crosses the site, in an east-west direction north of the N2 highway, with the Melkhoutbosch substation (Figure 3.1) located on this power line north of the N2-R330 interchange. The electricity generated at the Ubuntu wind energy project will feed into the 132 kV line and into the Melkhoutbosch substation.

The N2 is a main freight and tourist route between Port Elizabeth and Cape Town. Other main roads are the R102 between Jeffrey's Bay and Humansdorp and the R330 between Hankey and St Francis Bay. A number of relatively large structures are visible in the wind farm area, such as communication towers and chicken broiler housing. Various quarries are also present in the area. In addition there are viewpoints in protected areas which potentially will be affected by the wind farm. Of these, the Kabeljous River Nature Reserve and the Kabeljous River Natural Heritage Site are most likely to be affected.

The topography of the region is dominated by a flat coastal plain which gradually rises to the north and west to form the Cape Fold Belt mountains. The mountains and palaeo-marine deposits of the region have been deeply incised by the Gamtoos River system. The wind farm will be located on a palaeo-marine terrace adjacent to, and above, the Gamtoos River valley.

3.2.3 Ecology

The habitat is dominated by grazed grassy fynbos, or pastures containing fynbos elements that structurally resemble natural grassland. These areas of old farmland are now overgrown with grass and used for grazing, with dams and thicket in the kloofs and drainage lines. The majority of the land consists of cultivated fields, mainly producing fodder for livestock but used historically for crop production. A number of farm dams are present on the site and seasonal/ephemeral wetlands occur in the rainy season in flat areas, especially towards the northern part of the site. Ecological barriers in the area consist of fences, gravel farm roads, culverts and power lines. Biotic interactions are concentrated around pollination, seed dispersal, herbivory and predation. Utility lines and roads form corridors for bird mediated seed dispersal as well as vehicle mediated dispersal, in the case of roads.

A few scattered alien plant species are present, although these do not occur in abundance.

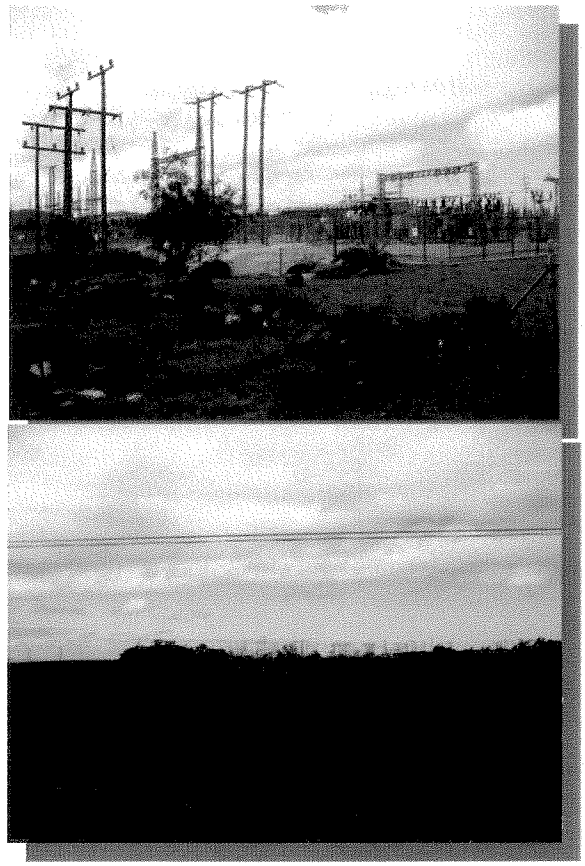


Figure 3.1: Melkhoutbosch substation, near the N2-R330 interchange north of Humansdorp

3.2.4 Flora and Fauna

The present vegetation consists of:

- Gamtoos Thicket restricted to kloofs and valleys along drainage lines, of which the latter are dominated by trees.
- Humansdorp Shale Renosterveld and Loerie Conglomerate Fynbos, which includes shrubby fynbos communities and low-lying seep and wetland/pan areas dominated by grasses and herbs with scattered thicket clumps, where not cultivated or transformed. Rocky outcrop communities also present on ridges with a mix of succulent and fynbos elements.
- Dams, streams and drainage lines of natural or anthropogenic origin with typical associated aquatic and riparian flora.

The Vegetation of Southern Africa Conservation Status (Mucina and Rutherford, 2006) of the vegetation types ranges from Least Threatened (Gamtoos Thicket and Loerie Conglomerate

Fynbos) to Endangered (Humansdorp Shale Renosterveld). The site is located outside the eastern extent of the Garden Route Biodiversity Sector Plan for the Kouga Municipality.

Terrestrial animal species that may occur in the study area mostly have a conservation status of Least Concern to Vulnerable and No Endangered or Critically Endangered terrestrial fauna are expected to occur within the site. The site does not host any butterflies of special concern and does not fall within an area of any Endangered or Critically Endangered reptiles as presented in Branch (1988). Vulnerable Blue Duiker (*Philantomba monticola*) and Endangered Oribi (*Ourebia ourebi*) have distributions that overlap with the locations of the wind farm, but due to the absence of preferred habitat, are not expected to occur on the proposed site. Hewitt's Ghost Frog (*Heleophryne hewitti*), which is regarded as Critically Endangered (Branch, 1988) is known to be present within a limited number of catchments within the Elandsberg mountains and no individuals of this species are expected to be present at the proposed site. It is, however, not impossible that they might occur as the presence of the species in the area has not been determined. A number of protected and endemic plant species are likely to occur in intact areas of natural vegetation.

3.2.5 Birds

The species that are most likely to be impacted are raptors (birds of prey) that use the favourable wind conditions on the ridges to forage. The site contains highly suitable habitat for Red List species, particularly the southern African sub-species of the Denham's Bustard, the South African endemic Blue Crane, Secretarybird, the southern African sub-species of the White-bellied Korhaan, the endemic Black Harrier and the Lanner Falcon. It is also an important area for the White Stork (Palaearctic migrant).

The micro habitats recorded in this study area are described below.

- **Natural fynbos**. The remaining areas of fynbos are mostly situated on slopes which have not been cleared for cultivation in the past, due to it being too rocky or steep for agricultural activity. These remaining areas of natural fynbos in the study area are potentially important for Red listed species such as Lanner Falcon, Peregrine Falcon, Martial Eagle, Secretary bird, Denham's Bustard and Black Harrier. Other priority species that that could be encountered here are mostly raptors such as Rock Kestrel, Jackal Buzzard, and Steppe Buzzard (see Table 3.1).

- **Old lands**. The majority of the study area consists of old agricultural lands where the natural fynbos vegetation was cleared when agriculture was practiced at some stage in the past (mostly cereal crops). These areas are now used for grazing and have reverted to a form of grassland, consisting of a mixture of indigenous and exotic grasses, with clumps of fynbos. This constitutes optimal habitat for Red listed Blue Crane, Denham's Bustard, White-bellied Korhaan and Secretarybird (see Table 3.1). These old lands are also very suitable for various raptors e.g. Black Harrier, Peregrine Falcon, Lanner Falcon, Steppe Buzzard, Jackal Buzzard and Amur Falcon. White Storks are also attracted to these areas.

- **Dams**. The area contains several dams and water bodies, mostly man made but also some natural and seasonal wetlands. These dams and pans, depending on the shape, can be important for some bird species. Dams with shallow sloping sides are suitable for a wider range of species. In the context of this study, shallow dams with sloping sides potentially could be roost sites for Blue Cranes and White Storks.

Water bodies are also frequented by a variety of waders and ducks, and could attract the Red listed Black Stork (see Table 3.1).

- **Drainage lines**. The study area contains one prominent seasonal drainage line. The banks of the drainage line show evidence of infestation by alien plants. Some of the larger trees in the drainage lines may be used by Secretary Birds for breeding and/or roosting.

- **Wetlands**. The drainage line and some of the dams in the study area have associated wetland areas, which may be of importance to Blue Cranes and the Red listed African Marsh Harrier (see Table 3.1).

The priority bird species that have been recorded on the site during the two seasons of transect monitoring are listed in Table 6.1 below. The following abbreviations are used to indicate conservation status:

- VU-Nationally Vulnerable (Barnes 2000)
- NT-Nationally Near Threatened (Barnes 2000)

Table 3.1: Priority bird species recorded during summer and winter transect surveys

Common Name	Scientific Name	Conservation status (Barnes 2000)	*Summer IKA = Index* of Kilometric Abundance, or *birds*/km	*Winter IKA = Index* of Kilometric Abundance, or *birds*/km
African Marsh Harrier	*Circus ranivorus*	VU	0.01	0.01
Amur Falcon	*Falco amurensis*	Common non-breeding Palearctic migrant	0.35	-
Black Harrier	*Circus maurus*	NT	0.08	-
Blue Crane	*Anthropoides paradiseus*	VU	0.32	0.06
Denham's Bustard	*Neotis denhami*	VU	0.68	0.7
Hottentot Buttonquail	*Turnix hottentotus*	Rare and localised endemic	0.01	-
Jackal Buzzard	*Buteo rufofuscus*	Common endemic	0.07	0.01
Southern Pale Chanting Goshawk	*Melierax canorus*	Near endemic	0.03	0.04
Rock Kestrel	*Falco rupicolus*	Resident	0.05	0.01
Secretarybird	*Sagittarius serpentarius*	NT	0.04	0.1
Steppe Buzzard	*Buteo vulpinus*	Common non-breeding Palearctic migrant	0.10	-
White Stork	*Ciconia ciconia*	Common non-breeding Palearctic migrant	0.01	-
White-bellied Korhaan	*Eupodotis senegalensis*	VU	0.08	0.3
Southern Tchagra	*Tchagra tchagra*	Common to rare endemic	-	0.02

3.2.6 Bats

Thirteen bat species have a geographical distribution that includes the study area. Four of these species are listed as Near-Threatened locally and one is Near-Threatened globally (Friedmann & Daly 2004; Monadjem, *et al.* 2010), whereas all other species are listed as Least Concern (see Table 3.2).

Although the site itself does not seem to have habitat that is attractive to bats such as caves, ridges with rock crevices or dense foliage, the broader areas surrounding the site are potentially attractive to bat habitat. The open grassland situated at an elevation of more than 200m also provides good foraging habitat for insectivorous bats feeding in the open air, such as *Tadarida aegyptiaca.*

The wind turbines could pose a potential hazard to eight of the 13 species, on account of their foraging habits. Some of the species are known to disperse over long distances, e.g. *Miniopterus schreibersii*, which disperses over 250 km (*Miniopterus natalensis,* which is present on the Ubuntu site, was previously included as a subspecies of *M schreibersii (*Monadjem, *et al.* 2010*)).* Furthermore some species are known to cover large distances when foraging at night or when moving between winter and summer roosts. No migration patterns have been recorded for bats in South Africa and the wind turbines will pose a risk to all bats whose migration routes cross the potential site.

Table 3.2: Bat species that are likely to occur on the proposed Ubuntu wind farm (Friedmann & Daly 2004; Monadjem, *et al.* 2010)

Species	Common Name	SA conservation status	Global conservation status (IUCN)
Epomophorus wahlbergi	Wahlberg's epauletted fruit bat	Least Concern	Least Concern
Eptesicus hottentotus	Long-tailed serotine (endemic)	Least Concern	Least Concern
Kerivoula lanosa	Lesser woolly bat	Near Threatened	Least Concern
Miniopterus fraterculus	Lesser long-fingered bat	Least Concern	Least Concern
Miniopterus natalensis	Natal long-fingered bat	Near Threatened	Near Threatened
Myotis tricolor	Temminck's myotis	Near Threatened	Least Concern
Neoromicia capensis	Cape serotine	Least Concern	Least Concern
Nycteris thebaica	Egyptian slit-faced bat	Least Concern	Least Concern
Rousettus aegyptiacus	Egyptian Rousette (endemic)	Least Concern	Least Concern
Rhinolophus capensis	Cape horseshoe bat (endemic)	Near Threatened	Least Concern
Rhinolophus clivosus	Geoffroy's horseshoe bat (endemic)	Near Threatened	Least Concern
Taphozous mauritianus	Mauritian tomb bat	Least Concern	Least Concern
Tadarida aegyptiaca	Egyptian free-tailed bat	Least Concern	Least Concern

Archaeology and cultural

The proposed Ubuntu Wind Energy Facility site is more than 5 kilometres from the coast and falls outside the coastal sensitive zone. Most of the proposed wind energy site has been ploughed in the past and now covered by dense short grass which made it difficult to find archaeological materials. Apart from a few stone tools no significant sites/materials were found and it is highly unlikely that in situ archaeological material/sites will be exposed during development. There are also two other important cultural sites in the wider vicinity of the development, namely, Kabeljous

River Shelter and the grave site of Sara Baartman. The developers should observe for any archeologically valuable features during the construction phase.

Palaeontology

The study area is largely underlain by fluvial conglomerates and minor sandstones of the Mesozoic Enon Formation (Uitenhage Group) that are locally mantled with a veneer of pebbly relictual soils of the so-called Bluewater Bay Formation (Algoa Group). Both of these rock units are very sparsely fossiliferous, so any proposed development on the coastal plateau here is likely to have very little impact on the local palaeontological heritage. Likewise, small outcrop areas of sandstone and quartzite bedrocks of the Palaeozoic Table Mountain Group (Skurweberg and Baviaanskloof Formations) on the western edge of the study area are predominantly fluvial in origin and contain a very restricted fossil record (mainly trace fossils, with occasional shell- and plant-rich horizons). Geologically recent (mainly Quaternary) alluvium associated with modern or ancient water courses such as the Kabeljousrivier may contain fossils such as silicified wood and other plant material, trace fossils, freshwater molluscs, or disarticulated vertebrate bones and teeth, but these tend to be very sparse.

3.3 SOCIO-ECONOMIC

The study area falls within the Kouga Municipal area in the Cacadu District. The Kouga Municipality has a population of 62 542 people (as indicated in the Kouga Municipality revised Integrated Development Plan (IDP) (2005/2006), with a low proportion of young people, 38 % being between the ages of 0 and 20 years (census 2001). The Municipality is a top performer in the Eastern Cape with low rates of dependency (1.29), unemployment (25 %) and poverty (31 %). Some 47 % of households in Kouga have members who receive social grants. This is the lowest percentage of households in the District (Kouga Municipality Annual Report 2005-2006).

Agriculture is one of the major contributors to Geographical Value Add (GVA) and employment in the area. However, this lucrative market is adversely affected by high numbers of people (including farm workers) infected with HIV/AIDS within the municipal area. Considering the district average of 17 %, the Kouga municipality has an estimate of 12 000 persons living with HIV/AIDS. Kouga currently has 14 330 patients with Tuberculosis (TB), 20 % of the total local population. As a consequence of the linkages between TB and HIV/AIDS, this should raise concerns for the delivery of primary health care.

A district survey indicated that Kouga is performing above average in terms of access to good roads, clinic services and public schools. Unfortunately the municipal area is doing particularly poorly in terms of access to hospitals and ambulance services.

Kouga has among the highest Formal Economy Performance scores, with positive factors including the positive trade balance, a fairly diversified economy, low financial grant dependence, and strong Gross Domestic Product (GDP) and employment growth performance. The local economy has experienced a positive shift increase in employment and GDP from 1996 to 2004, and is one of only two municipalities in the Province to emerge as leading economies in respect of both GDP and formal employment, provincially and nationally.

Kouga municipality is predominantly a rural area with seasonal influx of visitors to the popular coastal tourist destinations such as Jeffrey's Bay and Cape St Francis. It offers a wide range of tourist activities and attractions. These include historical and heritage sites, the Kouga Cultural Centre, surfing, fishing, hiking, biking, sand boarding, birding and game viewing, and various other outdoor and adventure activities (Kouga Municipality Annual Report 2005-2006).

Note: More detailed information on the demographics, employment and economic growth of the Kouga Municipality are provided in the Economics Chapter, Chapter 10 of this report.

3.4 PLANNING CONTEXT AND SURROUNDING LAND USES

The economy of the Kouga Municipal area has grown considerably over the last 10 years and has become a major holiday destination. The tourism market is growing tremendously and will further benefit from the establishment of a game reserve near Jeffrey's Bay. A Tourism Forum, where all the local tourism organisations are represented, was established to drive tourism in the Kouga region.

Agricultural production is on the increase and as the benefits of intensive land utilisation are becoming apparent its growth is constantly gaining momentum. Jeffrey's Bay is earmarked for intensive industrial development. A R1,2 billion commercial, residential and industrial development, known as The Fountains Estate, has been established in Jeffrey's Bay.

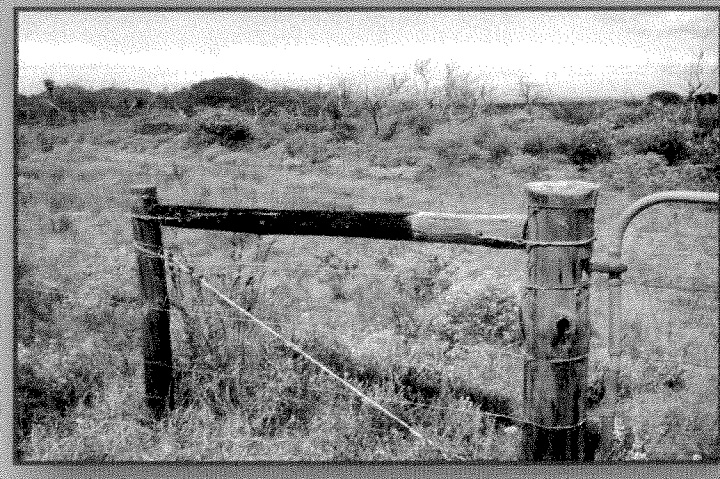
Activities on the land surrounding the wind farm site include:

- Stock farming;
- Crop farming; and
- Untransformed land (natural vegetation).

The site for the proposed Ubuntu wind farm is presently zoned for Agriculture. Farms Zuurbron and Vlakteplaas comprise old wheatfields that have been planted with indigenous grasses which now structurally resemble natural grassland. The site is currently being used for general farming activities and grazing and has been ploughed extensively in the past. The entire area for the proposed wind energy facility is covered mainly by dense grass with small patches of fynbos and alien vegetation

The area is not pristine and has been transformed by various human activities over the last two centuries. Nevertheless development should only proceed with due cognizance of environmental features.

Chapter 4: Approach to the EIA



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CHAPTER 4. APPROACH TO THE EIA

This chapter presents the approach to the impact assessment phase of the EIA process, including public participation. For information on the approach to Scoping, including the relevant legislation, key principles and guidelines that provide the context for this EIA process, refer to the Final Scoping Report (CSIR, 2011). As explained in the Final Scoping Report, the Ubuntu EIA process commenced in December 2009 and is therefore being conducted in terms of the 2006 EIA Regulations. A review was conducted to identify whether there are any additional listed activities arising from the promulgation of the 2010 EIA Regulations.

4.1 IDENTIFICATION OF ISSUES

The DEA *General Guide to the EIA Regulations* (Guideline 3, 2006) states that when the competent authority has accepted the Final Scoping Report and Plan of Study for EIA (PSEIA), the EIA phase may commence. The purpose of the EIA phase is to:

- Address issues that have been raised through the Scoping Process;
- Assess alternatives to the proposed activity in a comparative manner;
- Assess all identified impacts and determine the significance of each impact; and
- Formulate mitigation measures.

The EIA phase consists of three parallel and overlapping processes:

- Central assessment process involving the authorities where inputs are integrated and presented in documents that are submitted for approval by authorities (Section 4.5);
- Public participation process whereby findings of the EIA phase are communicated and discussed with I&APs and responses are documented (Section 4.3); and
- Specialist studies that provide additional information required to address the issues raised in the Scoping phase (Sections 4.6 and 4.7).

4.2 OVERVIEW OF APPROACH TO PREPARING THE EIA REPORT AND EMP

The results of the specialist studies and other relevant project information have been summarized and integrated into the Draft EIA Report. The Draft EIA Report will be released for a 40-day I&AP and authority review period, as outlined in Section 4.3. All I&APs on the project database will be notified in writing of the release of the Draft EIA for review. It is proposed that during this review period a public meeting is held as well as focus group meetings with key I&APs. The purpose of these meetings will be to provide an overview of the outcome and recommendations from the specialist studies, as well as provide opportunity for comment. Comments raised through written correspondence (emails, comments, forms) and at meetings (public meeting and focus group meetings) will be captured in a Comments and Responses Trail for inclusion in the Final EIA Report. Comments raised will be responded to by the CSIR EIA team and/or the applicant. These responses will indicate how the issue has been dealt with in the EIA process. Should the comment received fall beyond the scope of this EIA, clear reasoning will be provided. All comments received will be attached as an appendix to the Final EIA Report.

The Draft EIA Report includes a draft Environmental Management Plan (EMP), which was prepared in compliance with the relevant regulations. This EMP is based broadly on the environmental management philosophy presented in the ISO 14001 standard, which embodies an approach of continual improvement. Actions in the EMP were drawn primarily from the management actions in the specialist studies for the construction and operational phases of the project. If the project components are decommissioned or re-developed, this will need to be done in accordance with the relevant environmental standards and clean-up/remediation requirements applicable at the time.

An overview of the approach to the EIA process is provided in Figure 4.1.

4.3 PUBLIC PARTICIPATION PROCESS

The key steps in the public participation process for the EIA phase are described below. This approach has been accepted by DEA through their approval of the PSEIA. For background on the public participation during the Scoping Phase, refer to Chapter 4 of the Final Scoping Report.

Task 1: Review of Draft EIA Report and EMP

The first stage in the process will entail the release of the Draft EIA Report for a 40-day public and authority review period. Relevant organs of state and I&APs will be informed of the review process in the following manner:

- Advertisements placed in one local and one regional newspaper, e.g. EP Herald and Our Times, advertising the availability of the Draft EIA report for review as well as providing details of the public meeting to be held;
- Letter 4 to all I&APs (including authorities), with notification of the 40-day public review period for the Draft EIA and invitation to attend the public meeting (this letter will include the summary of the Draft EIA Report and a Comment Form);
- Public Meeting on the Draft EIA Report, where key findings of the EIA report will be communicated and I&APs will have the opportunity to provide comments and engage with the EIA team and project proponent;
- Focus Group Meeting(s) with I&APs, if requested; and
- Meeting(s) with key authorities involved in decision-making for this EIA, if requested.

The Draft EIA Report and EMP will be made available and distributed through the following mechanisms to ensure access to information on the project and to communicate the outcome of specialist studies:

- Copies of the report will be placed at the Jeffrey's Bay and Humansdorp Municipal Libraries;
- Relevant organs of state and key I&APs will be provided with a hard copy or CD version of the report;
- Report to be placed on the project website: www.publicprocess.co.za

The project database is regularly updated as and when information is sent to or received from I&APs. At the conclusion of the Scoping Process the project database included 70 registered I&APs. Subsequent to the submission of the Final Scoping Report, I&APs have requested to register their interest on the project database and the National Department of Environmental Affairs has instructed that specific I&APs are included on the database. The database has also been amended to take into account the Local Government elections and where appropriate newly elected Councillors for the area have been included on the updated project database. The database has been amended accordingly and now **includes 76 registered I&APs**. A copy of the project database is included as Appendix C of this report.

Task 2: Comments and Responses Trail

A key component of the EIA process is documenting and responding to the comments received from I&APs and the authorities. Subsequent to the submission of the Final Scoping Report to DEA and prior to the release of the Draft EIA, comments have been received from I&APs. These comments are captured in the Comments and Responses Trail of Appendix D of this report. Copies of the comments received are included in Appendix E. Letter 3 to I&APs regarding notification of submission of the Final Scoping Report are included in Appendix F.

During the Review of the Draft EIA Report and EMP, the following comments will be documented:

- Written and email comments (e.g. letters and completed comment forms);
- Comments made at public meetings;
- Comments made at focus group meetings;
- Telephonic communication with CSIR contact person; and
- One on one meetings with key authorities and/or I&APs.

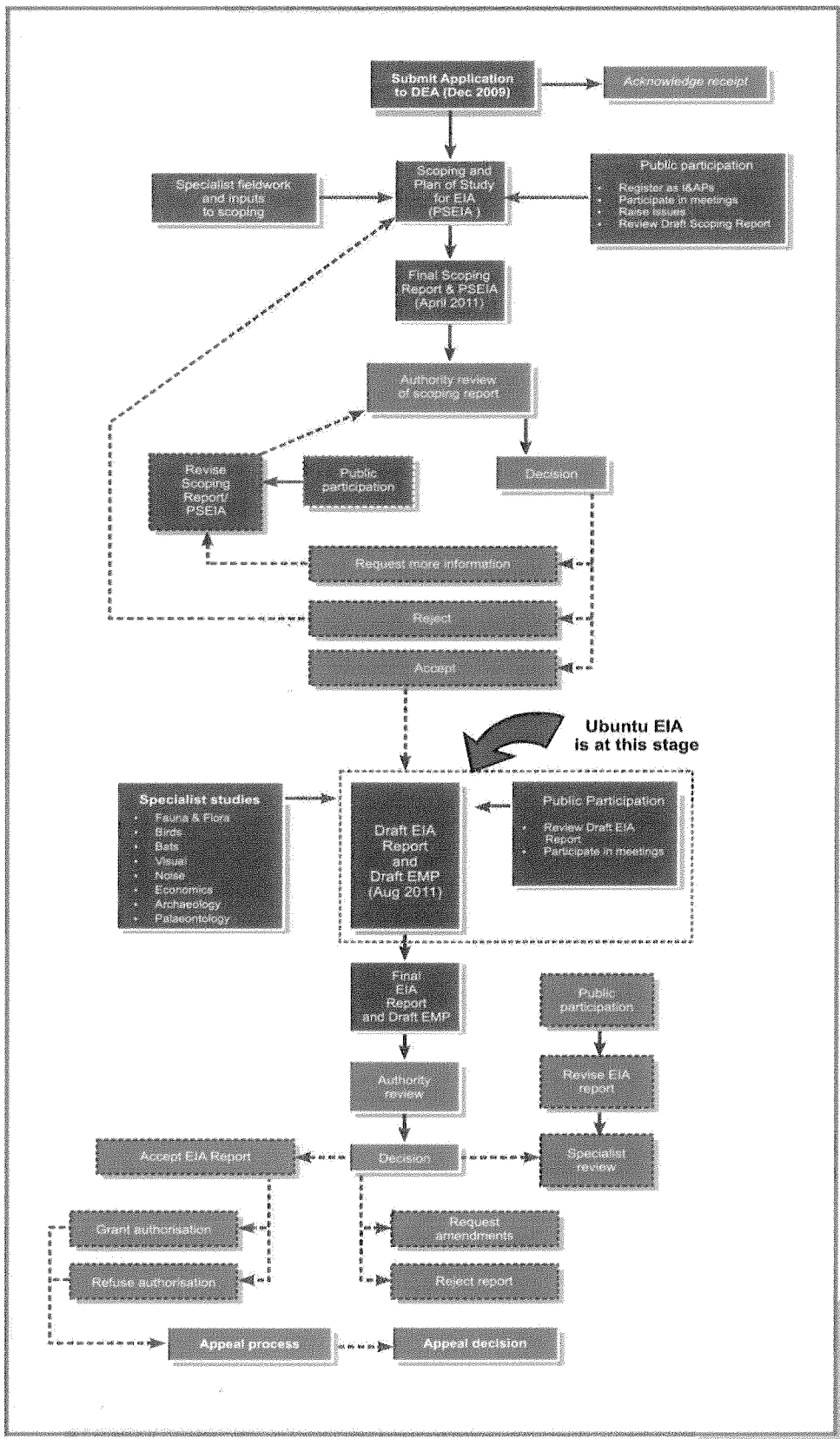
The comments received will be compiled into an updated Comments and Responses Trail for inclusion in the Final EIA Report. The Comments and Responses trail will indicate the nature of the comment, when and who raised the comment. The comments received will be considered by the EIA team and appropriate responses provided by the relevant member of the team and/or specialist. The response provided will indicate how the comment received has been considered in the Final EIA Report, in the project design or EMP for the project.

Task 3: Compilation of Final EIA Report for submission to Authorities

The Final EIA Report, including the Comments and Responses Trail and EMP, will be submitted to the authorities for decision making. Letter 5 will be sent to all I&APs on the project database notifying them of the submission of the final report. The Final EIA Report will be distributed as follows:

- Copies of the report will be placed at the Jeffrey's Bay and Humansdorp Municipal Libraries;
- Relevant organs of state and key I&APs will be provided with a hard copy or CD version of the report; and
- Report to be placed on the project website www.publicprocess.co.za.

Figure 4.1: EIA process for the Ubuntu project



Task 4: Environmental Authorisation and Appeal Period

All I&APs on the project database will be notified of the issuing of the Environmental Authorisation and the Appeal period. The following process will be followed for the distribution of Environmental Authorisation and notification of the appeal period:

- Copies of the Environmental Authorisation will be placed at the Jeffrey's Bay and Humansdorp Municipal Libraries;
- Letter 6 to be sent to all I&APs (including organs of state), with notification on the availability of the Environmental Authorisation and information on the Appeal Period; and
- Environmental Authorisation to be placed on the project website.

All I&APs on the project database will be notified of the outcome of the appeal period, this notification will be included in Letter 7 to I&APs.

4.4 AUTHORITY CONSULTATION DURING THE EIA PHASE

Authority consultation is integrated into the public consultation process, with additional one-on-one meetings held with the lead authorities where necessary. The authority consultation process for the EIA Process is outlined in Table 4.1 below.

Table 4.1. Authority consultation schedule for the EIA phase

Stage in EIA Phase	Form of Consultation (including provisional dates)
During Scoping phase	Ad hoc communications with DEA to discuss the outcome of the Scoping process.
During preparation of draft EIA Report and Draft EMP	Ad hoc communications with DEA to discuss the outcome of the Scoping process, preparation of the draft EIA and draft EMP and other legislative issues that may arise.
Public Review of draft EIA report and draft EMP; and attend public meeting	Review of draft reports: Authorities, together with other stakeholders, will have the opportunity to review the Draft EIA and EMP reports during the 40- day review period; and to attend the public meeting. If requested, CSIR can present the Draft EIA and EMP reports to the authorities at a dedicated authority meeting during this review period.
During the EIA process	Site visit: We propose to invite the authorities for a site visit to take place preferably at the same time of the public meeting for the Draft EIA and EMP reports.
During Final EIA report phase	Decision on final reports: Meetings with dedicated departments, if requested by DEA, with jurisdiction over particular aspects of the project (e.g. Local Authority) and potentially including relevant specialists.

4.5 APPROACH TO SPECIALIST STUDIES AND IMPACT ASSESSMENT

This section outlines the assessment methodology and legal context for specialist studies, in accordance with *Section 3: Assessment of Impacts*, in DEA Guideline 5, June 2006.

4.5.1 Generic Terms of Reference for the assessment of impacts

The identification of potential impacts should include impacts that may occur during the construction and operational phases of the activity. The assessment of impacts is to include direct, indirect as well as cumulative impacts.

In order to identify potential impacts (both positive and negative) it is important that the nature of the proposed activity is well understood so that the impacts associated with the activity can be understood. The process of identification and assessment of impacts will include:

- Determine the current environmental conditions in sufficient detail so that there is a baseline against which impacts can be identified and measured;
- Determine future changes to the environment that will occur if the activity does not proceed; and
- An understanding of the activity in sufficient detail to understand its consequences; and
- The identification of significant impacts which are likely to occur if the activity is undertaken.

As per DEA *Guideline 5: Assessment of Alternatives and Impacts* the following methodology is to be applied to the predication and assessment of impacts. Potential impacts should be rated in terms of the direct, indirect and cumulative:

- **Direct impacts** are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.

- **Indirect impacts** of an activity are indirect or induced changes that may occur as a result of the activity. These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

- **Cumulative impacts** are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

- **Spatial extent** – The size of the area that will be affected by the impact:
  - Site specific
  - Local (<2 km from site)
  - Regional (within 30 km of site)

- National.

- **Intensity** –The anticipated severity of the impact:
  - High (severe alteration of natural systems, patterns or processes)
  - Medium (notable alteration of natural systems, patterns or processes)
  - Low (negligible alteration of natural systems, patterns or processes).

- **Duration** –The timeframe during which the impact will be experienced:
  - Temporary (less than 1 year)
  - Short term (1 to 6 years)
  - Medium term (6 to 15 years)
  - Long term (the impact will cease after the operational life of the activity)
  - Permanent (mitigation will not occur in such a way or in such a time span that the impact can be considered transient).

Using the criteria above, the impacts will further be assessed in terms of the following:

- **Probability** –The probability of the impact occurring:
  - Improbable (little or no chance of occurring)
  - Probable (<50% chance of occurring)
  - Highly probable (50 – 90% chance of occurring)
  - Definite (>90% chance of occurring).

- **Significance** – Will the impact cause a notable alteration of the environment?
  - Low to very low (the impact may result in minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making)
  - Medium (the impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated)
  - High (the impacts will result in major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making).

- **Status** - Whether the impact on the overall environment will be:
  - positive - environment overall will benefit from the impact
  - negative - environment overall will be adversely affected by the impact
  - neutral - environment overall not be affected.

- **Confidence** – The degree of confidence in predictions based on available information and specialist knowledge:
  - Low
  - Medium
  - High.

- Management Actions and Monitoring of the Impacts (EMP)
- Where negative impacts are identified, mitigatory measures will be identified to avoid or reduce negative impacts. Where no mitigatory measures are possible this will be stated
- Where positive impacts are identified, augmentation measures will be identified to potentially enhance positive impacts

- Quantifiable standards for measuring and monitoring mitigatory measures and enhancements will be set. This will include a programme for monitoring and reviewing the recommendations to ensure their ongoing effectiveness.

The Table below is to be used by specialists for the rating of impacts.

Table 4.2: Table for rating of impacts

Direct Impacts							
Mitigation	**Spatial Extent**	**Intensity**	**Duration**	**Probability**	**Significance & Status**		**Confidence**
					Without Mitigation	**With Mitigation**	
Impact on Flora from increased risk of alien invasion in disturbed areas							
Alien invasive monitoring to be implemented as per EMP	Site	Medium	Long term	High	Medium	Low	Medium

Other aspects to be taken into consideration in the assessment of impact significance are:

- Impacts will be evaluated for the construction and operation phases of the development. The assessment of impacts for the decommissioning phase will be brief, as there is limited understanding at this stage of what this might entail. The relevant rehabilitation guidelines and legal requirements applicable at the time will need to be applied;
- The impact evaluation will, where possible, take into consideration the cumulative effects associated with this and other facilities/projects which are either developed or in the process of being developed in the local area; and
- The impact assessment will attempt to quantify the magnitude of potential impacts (direct and cumulative effects) and outline the rationale used. Where appropriate, national standards are to be used as a measure of the level of impact.

4.6 SPECIFIC ISSUES TO BE ADDRESSED IN SPECIALIST STUDIES

Based on an evaluation of issues to date, the following Specialist Studies are proposed as part of the EIA phase:

Table 4.3: EIA Team

EIA Management Team		
Paul Lochner	CSIR	Project Leader (EAP-SA)
Minnelise Levendal	CSIR	Project Manager
Specialist Team		
Jamie Pote	Private Consultant	Ecology (Flora and Fauna)
Chris van Rooyen	Chris van Rooyen Consultants	Birds
Stephanie Dippenaar Anna Doty	Private Consultant Nelson Mandela Metro University	Bats
Henry Holland	Mapthis	Visual impacts
Brett Williams	SafeTech	Noise
Dr Hugo van Zyl	Independent Economic Researchers	Economics
Dr Johan Binneman	Albany Museum	Archaeology
Dr John Almond	Natura Viva	Palaeontology
Public Participation Process		
Sandy Wren	Public Process Consultants	Public Participation Process

The Terms of Reference (ToR) for the specialist studies essentially consisted of the generic assessment requirements and the specific issues identified for each study. These issues have been identified through the baseline studies, I&AP and authority consultation, as well as input from the proposed specialists based on their experience. As part of the review of the Draft Scoping Report, specialists were requested to propose any additional issues for inclusion in the specialist studies. Additional issues, identified through public and authority consultation during Scoping, as well as specialist inputs, were included in the final Terms of Reference for specialists.

4.6.1 Fauna and Flora

The ecological specialist study included the following:

- Describe the vegetation in the study area;
- Determine species composition of each vegetation type, and the presence of potential protected species;
- Describe the current state of the vegetation on site;
- Describe the conservation status and value of the vegetation;
- Describe transformations and invasive alien plant species;
- Provide a vegetation sensitivity map of the site;
- Include Faunal Assessment (Mammal; amphibian and reptile);

- Identify and assess potential impacts on fauna and flora, outline mitigatory measures and outline additional management guidelines;
- Assess the significance of the impacts;
- Indicate potential no go areas;
- Identify management actions to avoid or reduce negative impacts on fauna and flora for inclusion in the EMP.

4.6.2 Birds

The bird specialist study included the following:

- A desktop review of available information that can support and inform the specialist study i.e. potential impacts on birds.
- Establish which species may occur in the area, their relevant conservation status and which ones would be potentially most at risk.
- Identification of issues and potential impacts related to birds, which are to be considered in combination with any additional relevant issues that may be raised through the public consultation process.
- Assessment of the potential, as well as potential cumulative, impacts on birds, both positive and negative, associated with the proposed project for the construction, operation and decommissioning phases.
- Compilation of a bird sensitivity map or identification of buffer zones to inform the turbine layout.
- Identification of management actions to avoid or reduce negative impacts; and to enhance positive benefits of the project on avifauna.
- In addition to the specialist study, a pre-construction bird monitoring programme is being undertaken. The results and recommendations of this monitoring programme should be included in the specialist bird reports and the EMP.

4.6.3 Bats

The bat specialist study included the following:

- Identify and assess the potential impacts of the wind project on bats and bat mortality.
- Establish which species may occur in the area and their relevant conservation status.
- Conduct field work to assess bat species presence at the proposed site, the presence of any large bat roosts or maternity colonies, and areas of foraging activity.
- Identify potential management plans to reduce the impact of the wind farm on the local bat community.
- Compilation of a bat sensitivity map or identification of buffer zones to inform the turbine layout.
- In addition to the specialist study, a pre-construction bat monitoring programme is being undertaken. The results and recommendations of this monitoring programme should be included in the specialist bat reports and the EMP.

4.6.4 Visual

The visual specialist study included the following:

- Conduct a desktop review of available information that can support and inform the specialist study.
- Identify and assess the potential visual impacts of the wind project on landscape character and sense of place, including a viewshed analysis and taking into consideration factors such as visual sensitivity and visual absorption capacity. This should be done in combination with any additional relevant issues that may be raised through the public consultation process.
- Identify possible cumulative impacts related to the visual aspects for the proposed project.
- Assess the potential impact/impacts, both positive and negative, associated with the proposed project for the construction, operation and decommissioning phases.
- Identify management actions to avoid or reduce negative noise impacts for inclusion in the EMP.

4.6.5 Noise

The noise specialist study included the following:

- Conduct a site visit to identify potential noise sensitive receptors.
- Identify issues and potential impacts, as well as possible cumulative impacts, related to the noise aspects for the proposed project.
- The measurement of the existing ambient noise (day and night time).
- A noise study/modelling of the future impact during construction and operation of the proposed project, taking into consideration sensitive receptors.
- Identify and assess the potential impacts associated with the proposed project for the construction, operation and decommissioning phases.
- Identify management actions to avoid or reduce negative noise impacts for inclusion in the EMP.

4.6.6 Economic

The Economic specialist study included the following:

- Describe the existing socio-economic characteristics/context of the local area and broader region.
- Identify and assess potential socio-economic impacts (e.g. job creation, skills development and training, community investment programmes, promotion of secondary industries etc) at local as well as wider scales as relevant. These are expected to include the following:
    - Broad level review of the need and financial viability/risks associated with the project.
    - Degree of fit with local, regional and national economic development visions and plans including renewable energy planning.

- Impacts on overall economic development potential in the area including impacts on commercial enterprises nearby the site (incl. agriculture, small businesses, tourism establishments and others).
- Impacts associated with project expenditure on direct and indirect employment and household incomes. These impacts should be investigated through an examination of how the project and the spending injection associated with it may impact on the local, regional and national economy.
- Impacts associated with environmental impacts that have economic implications. This should focus on positive impacts associated with renewable energy use as well as potential negative impacts on neighbouring land owners should they be relevant.

- Recommend mitigation measures to both minimise the negative socio-economic effects, and to maximise the positive socio-economic effects of the proposed development, both during construction and operations.
- Address any additional issues raised through the public participation process, and
- Propose and implement additional ToR, if required, based on professional expertise, experience and compliance with the relevant specialist study guidelines and best practice.

4.6.7 Heritage (archaeology, palaeontology, historical and cultural aspects)

- Identify and assess potential impact on archaeology (e.g. stone age artefacts)
- Identify and assess potential impacts on the built environment or places of historical and cultural significance (e.g. national monuments and grave sites).
- Identify and assess potential impact of excavations on palaeontology (e.g. fossils).

4.7 SUPPORTING TECHNICAL STUDIES

Soil potential
An **agricultural study** for the Ubuntu site was commissioned by WKN-Windcurrent during the preparation of the Draft EIA report. Johann Lanz, a soil scientist was contracted to investigate and report on soil conditions at the Ubuntu wind farm site. The aim of the investigation was to make an assessment of the agricultural suitability of the land that will be potentially impacted by the proposed wind farm project. The study was commissioned in response to a request from DEA to undertake a soil study after the review of the Scoping Report.

Aviation
WKN-Windcurrent obtained approval from the South African Civil Aviation Authority for the proposed Ubuntu project (see Appendix G).

4.8 APPROACH TO THE ASSESSMENT OF ALTERNATIVES

As per *Guideline 5: Assessment of Alternatives and Impacts* (DEA, June 2006), the EIA Regulations require that alternatives to a proposed activity be considered. Alternatives are different means of meeting the general purpose and need of a proposed activity. This may include the assessment of site alternatives, activity alternatives, process or technology alternatives, temporal alternatives and/or the no-go alternative.

The EIA Regulations indicate that alternatives that are considered in an assessment process be reasonable and feasible. I&APs must also be provided with an opportunity of providing inputs into the process of formulating alternatives. The assessment of alternatives should, as a minimum, include the following:

- The consideration of the no-go alternative as a baseline scenario;
- A comparison of the selected alternatives; and
- The providing of reasons for the elimination of an alternative.

The approach to investigating alternatives was presented in the Scoping Report (refer to Final Scoping Report, CSIR, 2011). An overview of these alternatives is provided below, together with updated information that incorporates the revised layout alternatives and findings from the specialist studies.

4.8.1 Location Alternatives

During the pre-feasibility for the project, WKN-Windcurrent reviewed a range of potential sites in the Kouga Region. These sites were evaluated based on a range of criteria such as:

- Local wind climate, using data from local weather stations in the area;
- Local power line network, including existing grid availability, stability and capacity, local power utilisation, future developments and planned power line upgrades;
- Road access for construction and operational maintenance and the topography of the site;
- Existing wind farm development proposals;
- Engagement with landowners; and
- The visibility of the project with regard to local habitation and tourism.

Based on the above review, WKN-Windcurrent selected the Ubuntu site located near Jeffrey's Bay (subject of this EIA) as its option. Following site selection WKN-Windcurrent moved forward towards a feasibility study. An environmental screening study for the Ubuntu site was undertaken by the CSIR in November 2009. Based on this preliminary screening, it was concluded that there were no fatal flaws identified from an environmental perspective that would necessitate termination of the project at this stage, provided that the exclusion criteria are reviewed in more detail as part of the forthcoming planning in the EIA phase.

4.8.2 No-go alternative

This alternative will be included in the EIA as a benchmark against which to assess the impacts (positive and negative) of the proposed Ubuntu Wind Energy Project. The main negative implication of the no-go option is lack of power supply through the wind farm.

Selecting the no-go alternative will reduce the risk of bird and bat mortalities as no turbines would be erected. Furthermore, potential negative impacts on vegetation, biodiversity and the visual character of the area would also be avoided by the no-go alternative.

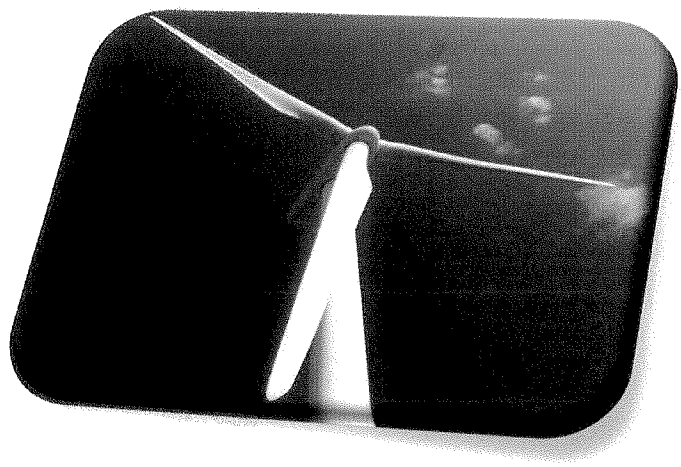
4.8.3 Land use alternative

At present the proposed site is zoned for Agriculture, and is mainly used for extensive cattle grazing.

The physical footprint of the turbines is very limited. Turbines will be supported on foundations dimensioned to the geotechnical properties, for example reinforced concrete spread foundations of approximately 20 m by 20 m and 3 m in depth. The farm covers approximately 1138 hectares. After construction, the turbine mast footprints will cover approximately 0.09 % of the total area. Current cattle farming activities would continue beneath and around the turbines.

4.8.4 Activity alternatives as part of the development

The fundamental goal of the WKN-Windcurrent project is the economically viable generation of renewable energy (RE) on a commercial scale. Theoretically, RE alternatives which could potentially achieve the same power generation targets include solar power generation (concentrated solar power and photovoltaic), hydro-electricity and biomass-based energy generation. Wind energy was selected as the energy source of choice due to the very favourable wind regime of the Kouga area, compared to the relatively poor solar, hydro and biomass resources in the study area (refer to Figures 4.2 to 4.5).



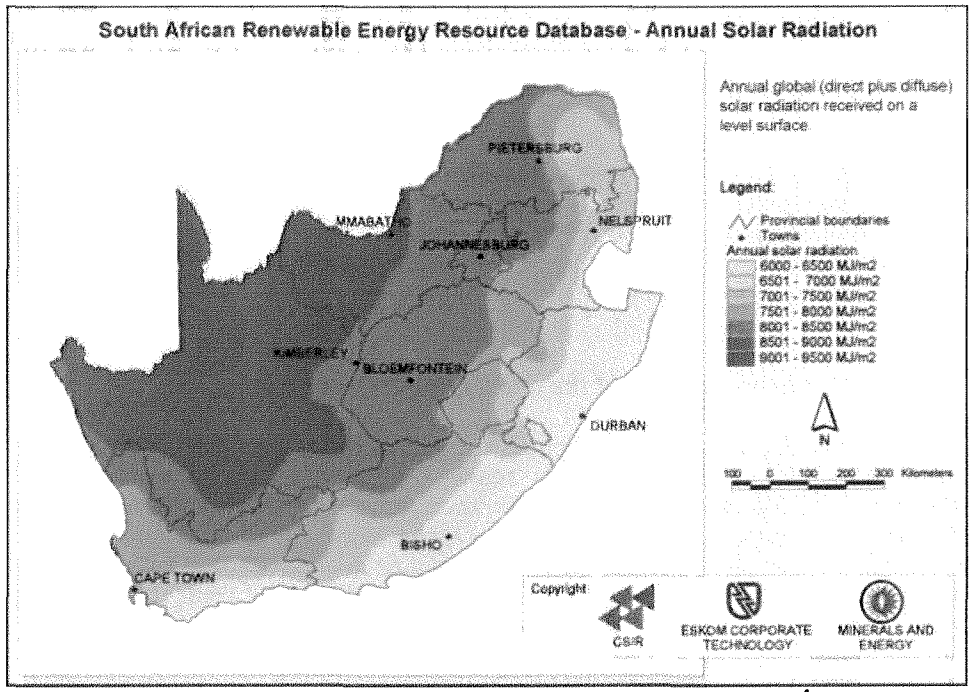


Figure 4.2: South African annual solar radiation in MJ/m^4

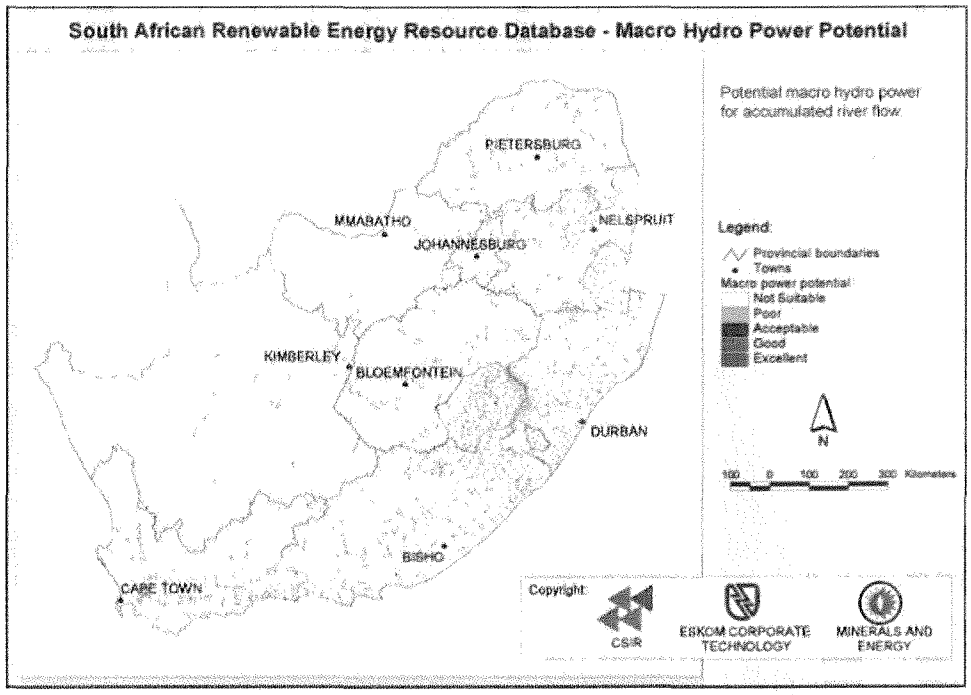


Figure 4.3: South African macro hydro power potential

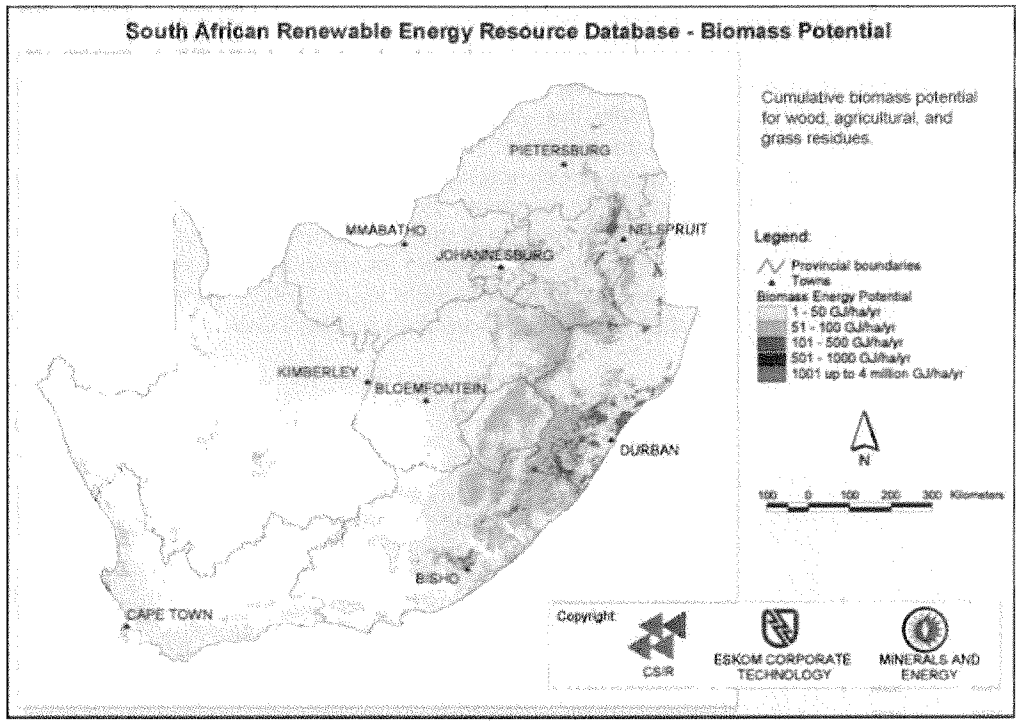


Figure 4.4: South African biomass potential

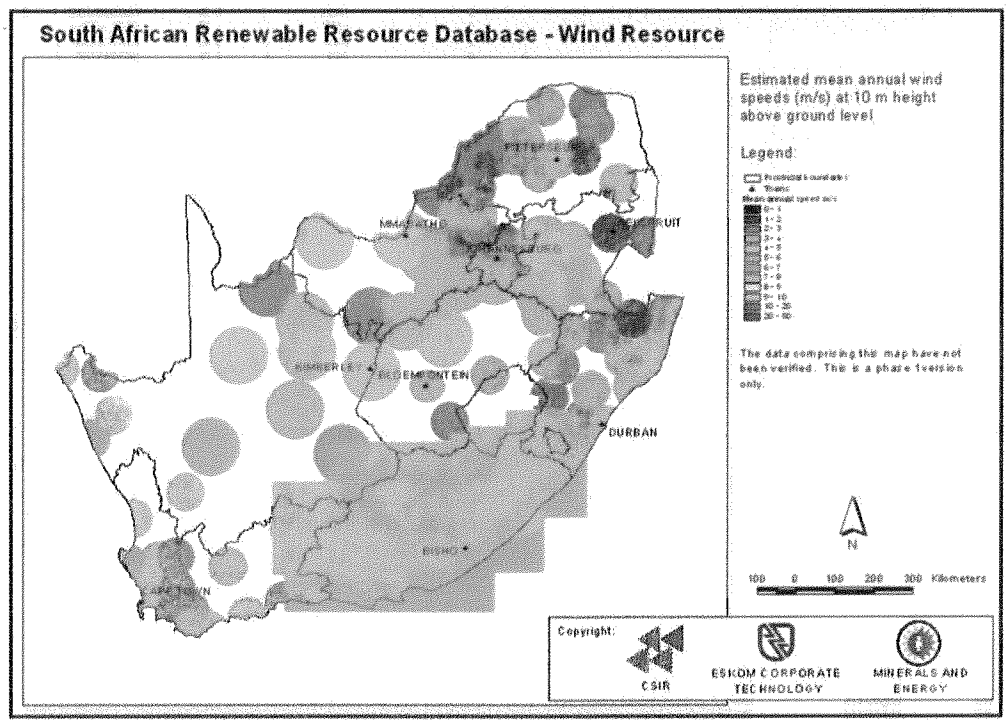


Figure 4.5: South African wind resource with the study area receiving between 4-5m & 5-6m/second mean annual wind speeds

4.8.5 Technology alternatives as part of the development

The only feasible technological alternative to the horizontal axis wind turbine (HAWT) is the vertical axis wind turbine (VAWT). With the VAWT system, the turbine rotor shaft is mounted vertically as opposed to the horizontal mount of the HAWT (Figure 4.6). Such a configuration affords the VAWT various advantages, most notably; easy access to the turbine gearbox and relative quiet operation. WKN-Windcurrent, however, did not consider VAWT to be a reasonable alternative technology due to the unproven nature of these turbines at a commercial or Megawatt scale as well as its reduced efficiency (due to its relative low height and subsequent lower wind speeds at ground level) compared to that of HAWT (REFOCUS, 2003). Further the HAWT have proven worldwide that it has installed capacity of more than hundred GW.

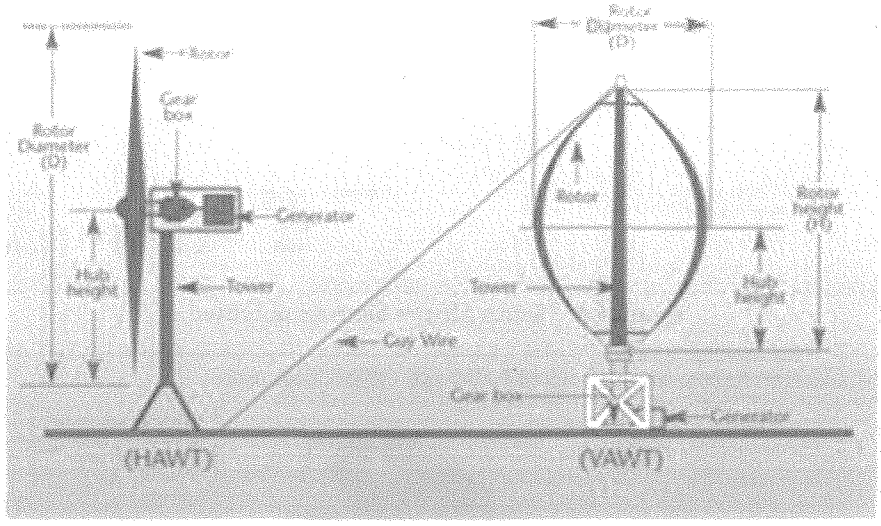


Figure 4.6: Comparison between HAWT and VAWT systems (not to scale)

4.8.6 Activity and layout alternatives as part of the development

Different scales of turbines and different turbine technology providers were considered by WKN-Windcurrent. When considering alternative suppliers, key factors were availability of turbines on the international market, suitable to the South African wind climate, and service levels and experience in South Africa.

Currently WKN-Windcurrent has selected the alternative turbine suppliers and sizes listed below for the proposed Ubuntu wind energy project. The selection of the turbine providers might however still change according to market and price variables. WKN-Windcurrent has prepared three alternative layouts based on these alternative suppliers and turbine sizes (see Figures 4.7-4.9).

- Vestas V90 (2 MW) – will comprise 50 turbines (see layout in Figure 4.7);
- Vestas V112 (3 MW) – will comprise 33 turbines (see layout in Figure 4.8); and
- Nordex N100 turbines (2.5 MW) – will comprise 40 turbines (see layout in Figure 4.9).

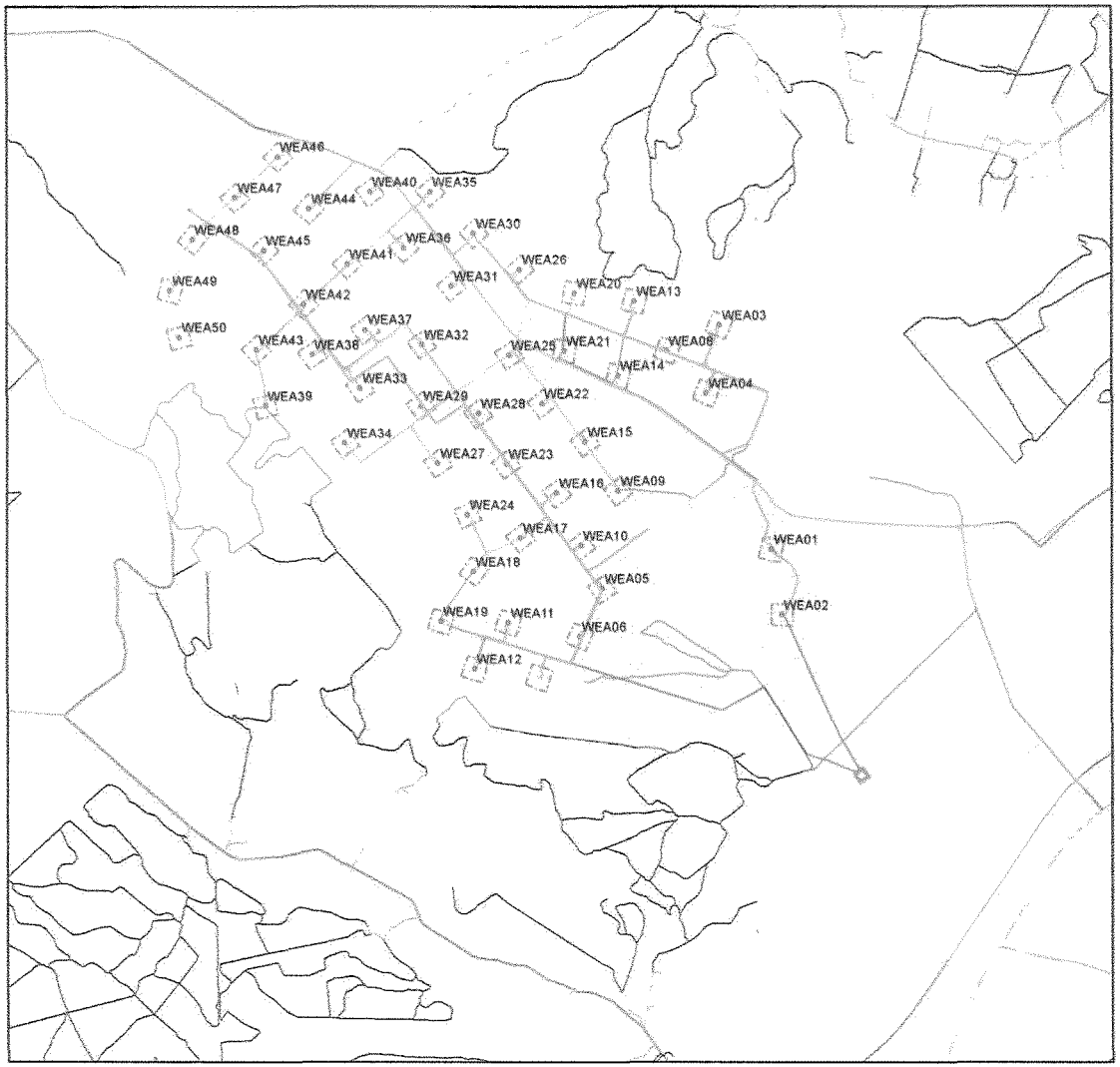


Figure 4.7: Proposed layout for the Vestas V90 (2 MW) turbines (50 turbines) for the proposed Ubuntu project.

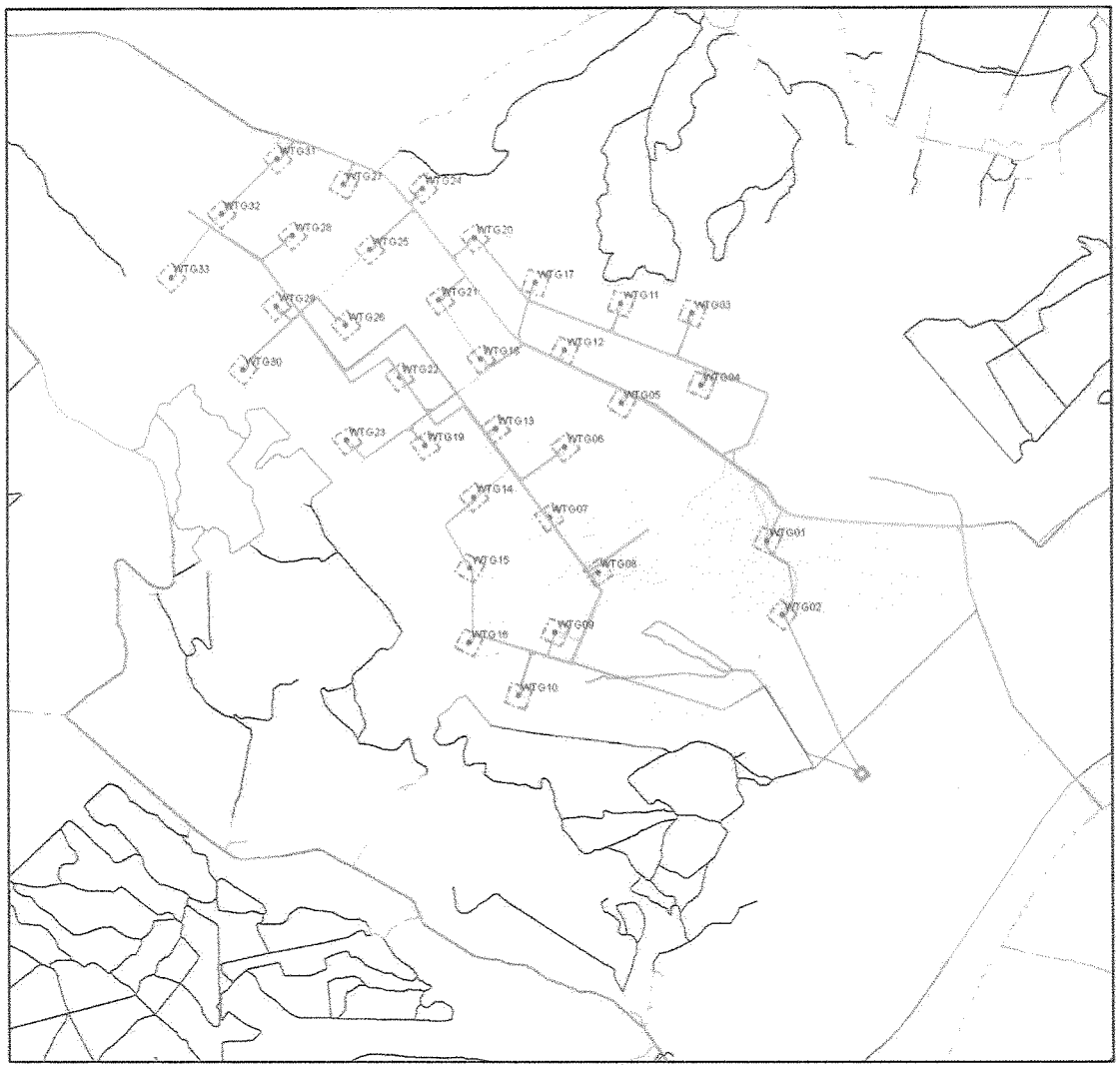


Figure 4.8: Proposed layout for the Vestas V112 (3 MW) turbines (33 turbines) for the proposed Ubuntu project.

Figure 4.9: Proposed layout for the Nordex N100 (2.5 MW) turbines (40 turbines) for the proposed Ubuntu project.

In addition to the three potential turbine layouts shown in Figures 4.7-4.9, WKN-Windcurrent is also proposing four additional turbine locations (see Figure 4.10). These alternative turbine locations will be used should individual turbine locations of the current proposed locations not be favourable from an environmental perspective.

The current layouts prepared by WKN-Windcurrent were reviewed by the specialists working on the project and went through several iterations. The current layouts were informed by the identification of buffer zones or no-go areas identified by the specialists (see Figure 4.11). These include factors such as the proximity to the dwellings, proximity to roads, linkage to access road, undisturbed natural areas, proximity to wetlands, the botanical sensitivity of the proposed area as well as the sensitivity of the area from a birds and bats perspective. The turbine layouts were also informed by the wind regime (climate). The wind measurement data were obtained from the existing wind measuring mast which informed the alignment of the turbines to ensure maximum wind absorption.

4.9 SCHEDULE FOR THE EIA

The proposed schedule for the EIA, based on the legislated EIA process, is presented in Table 4.3. It should be noted that this schedule might be revised during the EIA process, depending on factors such as the time required for decisions from authorities.

Figure 4.10: Alternative 4 turbine locations provided by WKN-Windcurrent for the proposed Ubuntu project

Figure 4.11: Proposed no-go areas identified in the specialist studies for the proposed Ubuntu project.

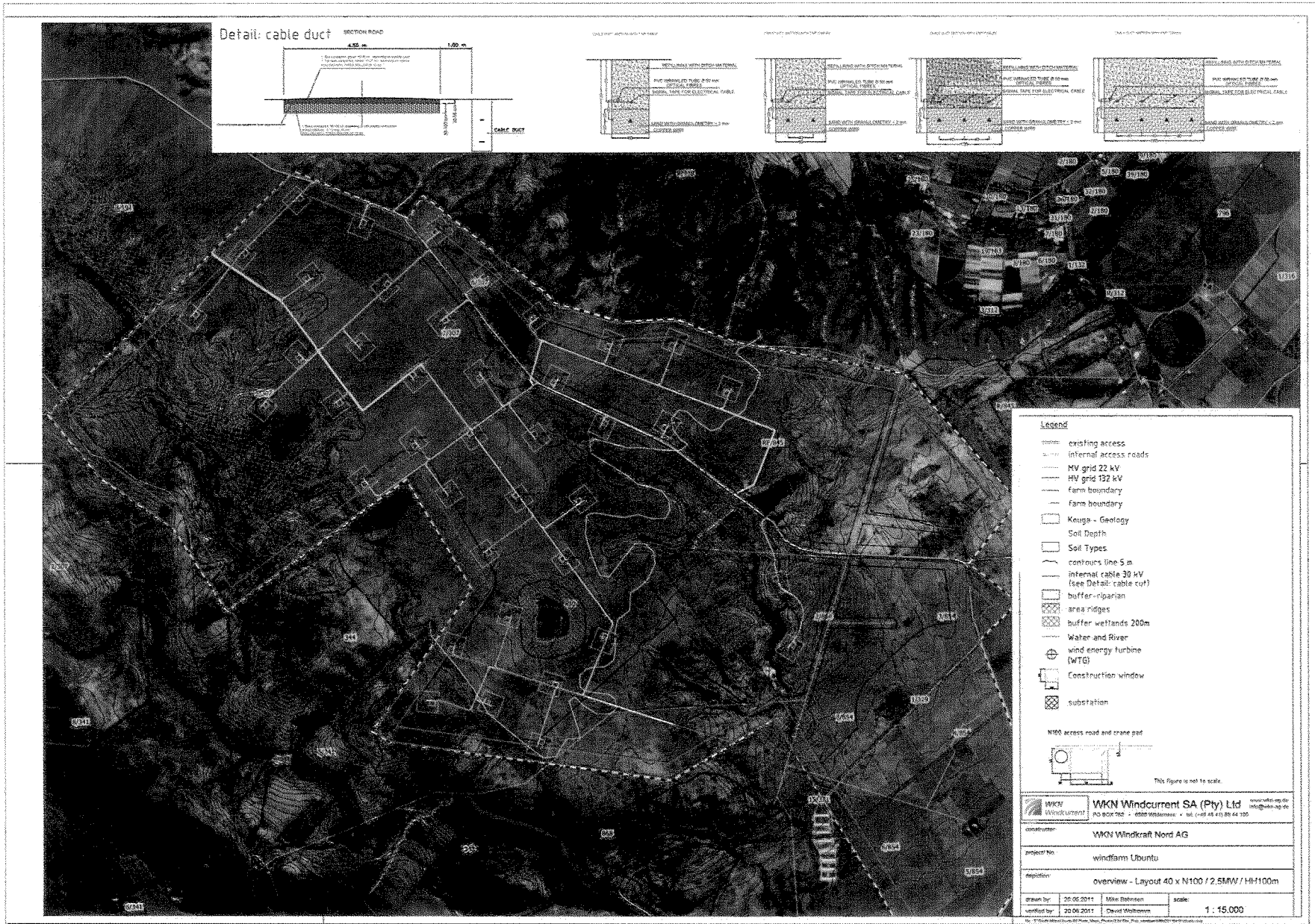


Table 4.4: EIA Schedule for the Ubuntu Wind Energy Project

TASKS		EIA SCHEDULE (MONTHS)																	
		2010 Nov	Dec	2011 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	2012 Jan	Feb	Mar
1	Establish I&AP database, prepare BID and announce EIA																	
2	I&AP registration & meetings with key stakeholders to source issues																	
3	Prepare Draft Scoping Report (DSR) and Plan of Study for EIA (PSEIA)																	
4	Public comments period (40-days) on DSR and stakeholder meetings																	
5	Submit Final Scoping Report (FSR) and PSEIA to authorities for decision (30 days)																	
6	Communicate authority decision to I&APs and process for next phase																	
7	Specialist studies (including fieldwork)																	
8	Prepare Draft EIA Report and EMP and submit to DEA																	
9	Public review of Draft EIA Report and EMP (40-days)																	
10	Submit Final EIA Report and Draft EMP to authorities																	
11	Decision by authorities (115 days)																	
12	Appeal process																	

Key:
BID: Background Information Document
DEA: National Department of Environmental Affairs
DEIA: Draft EIA report
DSR: Draft Scoping Report
PSEIA: Plan of Study for EIA
EMP: Environmental Management Plan

Environmental Impact Assessment for the proposed Ubuntu Wind Energy Project near Jeffrey's Bay, Eastern Cape: Draft Environmental Impact Assessment Report

Chapter 5: Impact on Fauna and Flora

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5 IMPACT ON FAUNA AND FLORA

5.1 INTRODUCTION

5.1.1 Approach to the study

Mr Jamie Pote was sub-contracted by the CSIR to undertake a terrestrial ecological assessment of the proposed Ubuntu Wind Energy Project near Jeffrey's Bay. Site visits were conducted during January 2011 and May 2011. Mr Mark Marshall of Sandula Conservation assisted with the faunal survey and assessment (Terrestrial Mammals, Reptiles and Amphibians).

5.1.2 Terms of Reference

5.1.2.1 Flora

The TOR for ecological studies are to:

- Carry out fieldwork to locate and describe the vegetation on the study area, the key focus being on determining the impact footprint(s) for the site;
- Determine the species present and localities within each vegetation types;
- Determine whether the study area falls wholly or partially within the distribution range of species listed as Vulnerable, Endangered or Critically Endangered and Protected;
- Provide a description of the current state of the vegetation on site supported by relevant photographs;
- Identify and describe the conservation value and conservation planning frameworks relevant to this site (Regional Planning) for the represented vegetation units;
- Describe the areas where indigenous vegetation has been transformed;
- Determine which alien species are present, their distribution within the study area, and recommended management actions;
- Note and record the position of unusually large specimens of trees;
- Provide a detailed vegetation sensitivity map of the site, including mapping of disturbance and transformation on the site;
- Intergrate the faunal assessment (terrestrial mammals, reptiles and amphibians) into the Ecological (Biodiversity) Assessment Report;
- Identify and rate potential impacts, outline mitigatory measures, and outline additional management guidelines; and
- Provide an Environmental Management Plan (EMP), including generic rehabilitation and revegetation guidelines.

5.1.2.2 Fauna

This specialist report describes, and assesses the potential impact on, the terrestrial fauna present in the area that will be affected by the proposed development. It also addresses the existing impacts resulting from the current land use as it affects the fauna. Most of the faunal diversity was assessed on the basis of the presence of suitable habitat, tracks, signs (droppings, feathers, tracks, etc.) as well as documented distributions. A site visit was undertaken in May

2011 but no specific faunal collections were made. The presence of alien and extra-limital species in the region has also been noted. It should be noted that birds and bats are addressed separately in Chapters 6 and 7 of this report respectively.
The following faunal groupings have been investigated:

- Amphibians;
- Reptiles; and
- Mammals (excluding bats).

For amphibian species, the A Complete guide to the frogs of Southern Africa (Du Preez & Carruthers 2009) and Atlas and Red data book of the frogs of South Africa, Lesotho and Swaziland (Minter et al 2004) were used to identify potentially-occurring frogs. Potentially-occurring reptiles were identified by using Branch (1998), Marais (2004) and Alexander and Marais (2007) and using the online resources of the ADU (http://sarca.adu.org.za/). Field Guide to Mammals of Southern Africa (Stuart & Stuart 2007) and A Field Guide to the Tracks and Signs of Southern and East African Wildlife (Stuart & Stuart 2000) were used for the identification of potentially-occurring mammals. Because of their large numbers in terms of taxa, invertebrates are rarely considered in detailed environmental management plans. South African Red Data Lists of Threatened Species (using IUCN categories) are available for: amphibians (Minter et al. 2004), reptiles (Branch 1988b, 2002, and updates), and mammals (Friedmann and Daly 2004).
To clarify, species of special concern (SSC) are animals that are known to be:

- endemic to the region;
- that are considered to be of conservational concern;
- that are in commercial trade (CITES or ToPS listed species); or,
- are of cultural significance.

5.1.3 Assumptions and limitations

A number of limitations apply to this study.

5.1.3.1 Flora

- Botanical surveys based upon a limited sampling time period may not reflect the actual species composition of the site because of seasonal variations in flowering times.
- While all reasonable attempts were made, the author cannot guarantee that all plant species were recorded during the assessment because of the rapid sampling and assessment techniques employed.

5.1.3.2 Fauna

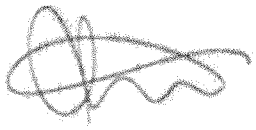
- Faunal surveys may not reflect the actual species composition of the site because of seasonal variations.
- An amphibian survey was conducted in the autumn thus actual presence/absence of species could not necessarily be verified and reliance on literature sources was necessary.

5.1.4 Information sources

Information was obtained from literature sources for the desktop component of the study. Fieldwork was conducted to obtain site-specific information and local expert knowledge was also obtained where pertinent and available.

5.1.5 *Declaration of Independence*

I, Jamie Pote, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed WKN-Windcurrent SA (Pty) Ltd Ubuntu Wind Energy Project, application or appeal in respect of which I was appointed, other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.



JAMIE POTE

5.2 DESCRIPTION OF ASPECTS OF THE PROJECT THAT POTENTIALLY COULD CAUSE IMPACTS ON THE FAUNA AND FLORA

The key components of the project and their respective impacts upon the terrestrial faunal and floral environment are:

5.2.1 *Wind turbines generators*

Wind farm Component	Ecological impacts
Wind turbine generators	
Turbines will be supported on reinforced concrete spread **foundations**	The terrestrial environment will be impacted where vegetation clearing is required for constructing turbine foundations.
Electrical transformers will be placed beside each turbine.	The terrestrial environment will be impacted where vegetation clearing is required for electrical transformers
Gravel surfaced **hard standing areas** (adjacent to each turbine for use by cranes during construction and retained for maintenance use throughout life span of the project.	The terrestrial environment will be impacted where vegetation clearing is required for hard standing areas
Electrical connections	
The wind turbines typically will be connected to each other and to the substation using, in most cases, buried **(1 m deep) medium voltage cables**, except where a technical assessment of the proposed design suggests that overhead lines are appropriate.	The terrestrial environment will be impacted where vegetation clearing is required for cable trenches outside of road reserve
A new **sub-station** and transformer to the 132 kV Eskom grid will be built. Preferably close to the 132 kV line.	The terrestrial environment will be impacted where vegetation clearing is required for substation construction

Wind farm Component	Ecological impacts
Other potential infrastructure	
Operations and maintenance building:	The terrestrial environment will be impacted where vegetation clearing is required for the warehouse/ workshop (0.5 ha)
Fencing as required.	Dependent on the type and extent of fencing it may act as a barrier to ecological processes and cause mortalities to animals. (especially if the fence is electrified)
Temporary **wind measuring mast** of 100m height.	The terrestrial environment is temporarily affected by mast base footprint
Roads	
Gravel access roads onto the site from the public road	The terrestrial environment will be impacted where vegetation clearing is required for road construction
An **internal road network** to the turbines and other infrastructure (substation and operation and maintenance building). The road network may include turning circles for large trucks, passing points and culverts over gullies and rivers.	The terrestrial environment will be impacted where vegetation clearing is required for road construction Ecological processes may be impacted where linear features impact ecological corridors The road network may result in barriers to faunal movement and result in mortalities
All roads width 6 m plus cabling and drainage.	Road width, extent and final design will affect the overall impact upon the terrestrial environment.
Upgrading of certain **existing roads** may take place.	Upgrading of existing roads, and rehabilitation of old roads will reduce the overall impact on the terrestrial environment
Temporary activities during construction	
Lay down area, besides an access route	The terrestrial environment will be impacted where vegetation clearing is required for hard-standing area (1 ha) if permanent.
The overall **site compound** for all contractors	The terrestrial environment will be impacted where vegetation clearing is required for the site compound.

5.3 DESCRIPTION OF AFFECTED ENVIRONMENT

5.3.1 Site Location

The site is located north-east of Jeffrey's Bay, Eastern Cape (Figure 5-1).

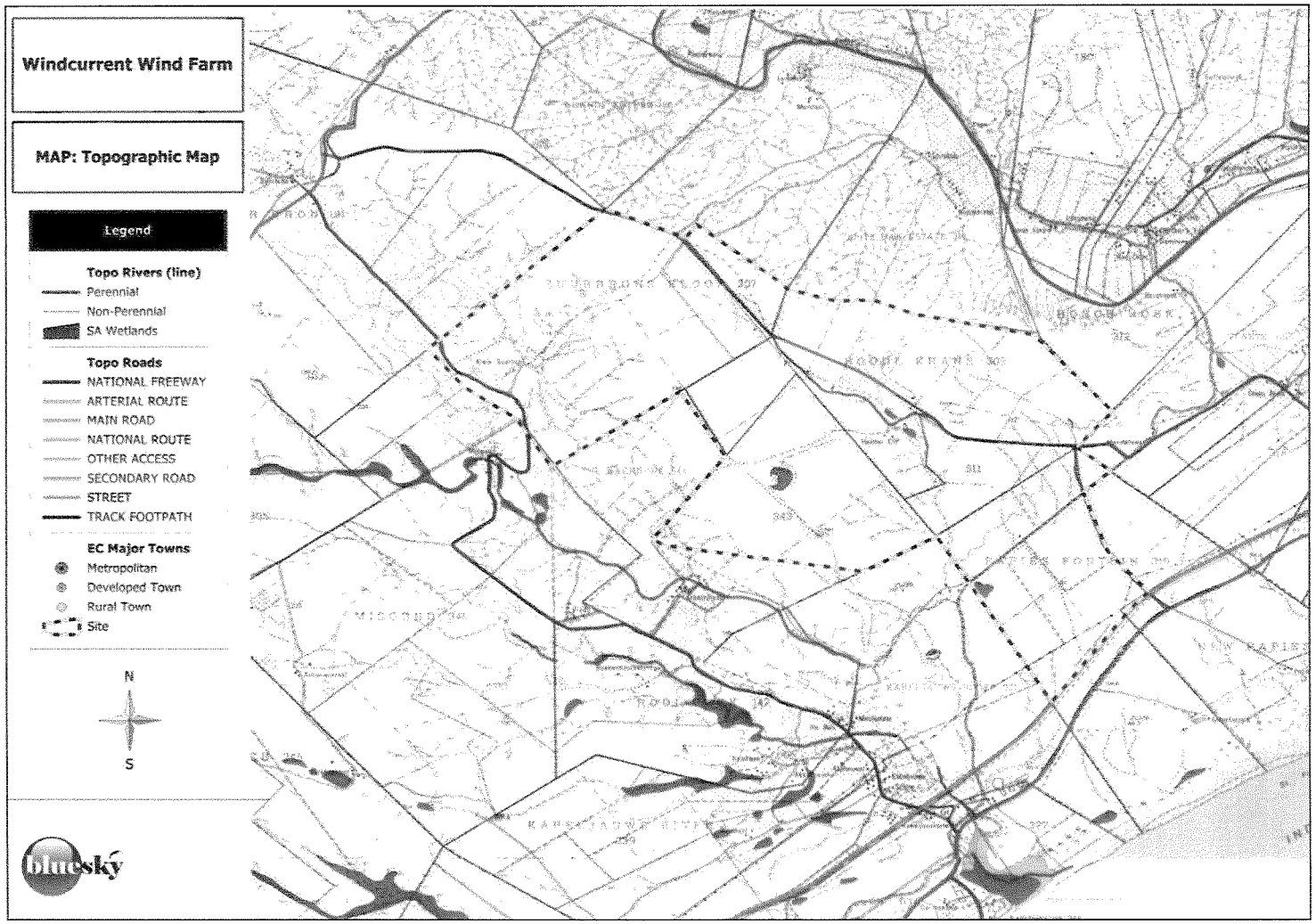


Figure 5-1: Site locality, north-east of Jeffrey's Bay.

5.3.2 *Site Topography*

In general the site is located in the middle of a slightly undulating plateau with deeply incised river valleys on the east and west and a small seasonal drainage line bisecting the site (Figure 5.1). In general soils on the plateau are well developed with shallower, rocky soils where the topography slopes towards the drainage lines. A seasonal wetland is present in the middle of the site and a number of small dams are present along the drainage lines.

Figure 5-2: Aerial photo of the site, indicating 5 m contours and key topographical features.

5.3.3 Regional Planning Framework

The Eastern Cape Province has highly diverse vegetation since it occupies an area where the biomes of South Africa converge (Rutherford and Westfall, 1994). As a result, the Eastern Cape vegetation is a mosaic of vegetation types, many of which have become severely threatened by development (Lubke *et al.*, 1988, Low and Rebelo, 1996). The vegetation of the region falls in the *Tongoland-Pondoland phytochorion* (White, 1983) that is considered to have originated in Natal and migrated south-westward where it merged with the *Cape Fynbos and arid Succulent Karoo flora*, hence the vegetation is generally highly diverse.

The Cape Floral Kingdom, typically referred to as Fynbos, is generally characterised by three elements: the tough, wiry restioids (Cape Reeds) form the graminoid (grass-like) layer; the heath component is composed of small, narrow-leafed shrubs (the most famous examples are the Ericas); the proteoid component of proteas, cone-bushes and pin-cushions (Campbell & Sigonyela, 2001). Within the study area, the dominant component is a Renosterveld-Thicket mosaic with a Grassy Fynbos component. In Grassy Fynbos, true grasses largely replace the restioids although several species of Restionaceae are still found. The grasses are common widespread species that are fairly drought-hardy (C^4 grasses).

Cowling (1984) identified Subtropical Transitional Thicket as a vegetation class that extended from the Kei River to the south-western Cape, and defined it as follows: (i) dominance of species of Tongoland-Pondoland affinity with strong links to the Karoo-Namib (drier forms) and Afromontane (wetter forms) Regions; (ii) relatively low regional endemism (at least in comparison with elsewhere in the fynbos biome), comprising mainly succulent species of karroid affinity; (iii) dominated by broad-leaved sclerophyllous shrubs, many of which have spines, and having a conspicuous woody vine and succulent component, especially in drier forms; and (iv) associated with deepish, well-drained and relatively fertile soils. It is not fire-prone and is functionally similar to forest, for example in nutrient-cycling processes and the high incidence of species with vertebrate-dispersed fruits. (Midgley *et al.* 1997). However, thicket differs from forest in that (i) large herbivores (Kerley *et al.* 1995) and not tree falls are the major source of disturbance; (ii) most canopy species regenerate by Ramet (clonal) recruitment (Midgley and Cowling (1993); dominant canopy species are relatively shade-intolerant (Holmes and Cowling (1993); and it grows where annual rainfall may be as low as 200 mm (Acocks 1953).

Systematic Conservation Planning provides a framework that highlights national and regional conservation planning processes. At a national level and regional planning level the Vegetation of Southern Africa (2006) and the Sub Tropical Ecosystem Planning Conservation Assessment (2003) serve to *'assist land-use planners and decision-makers, especially in municipalities, to integrate biodiversity information into land-use planning and decision-making'*. No local planning frameworks currently exist for the site that would identify those areas that are critical for conserving biodiversity and facilitate the integration of biodiversity into decision-making (i.e. mainstreaming biodiversity). In general local conservation frameworks aim to minimise the loss of natural habitat in **Critical Biodiversity Areas** (**CBA**) and prevent the degradation of **Ecological Support Areas** (**ESA**), while encouraging sustainable development in other natural areas. In general the guidelines for local conservation plans designate habitats having an elevated conservation status as being **Critical Biodiversity Areas** with **Ecological Support Areas**, tending to include corridors along drainage lines and rivers. For the purposes of this report important drainage features are designated as **ESAs** and vegetation units deemed to have an elevated conservation status as **CBAs.**

A summary of the affected vegetation units and conservation/ecosystem status as per the various National and Regional Bioregional Plan are provided for Mucina & Rutherford Vegetation of Southern Africa in (Table 5.1; VegSA; **Error! Reference source not found.**) and Sub-Tropical

Ecosystem Planning (Table 5.2; STEP; **Error! Reference source not found.**). These national and regional plans provide the most recent available descriptions of the general floral environment present within the area, as well as the respective conservation status of the respective vegetation units.

5.3.3.1 Vegetation of Southern Africa

At a *national* scale, Mucina & Rutherford (2006; SAVeg) classify vegetation units present within the wind farm sites as indicated in Table 5.1.

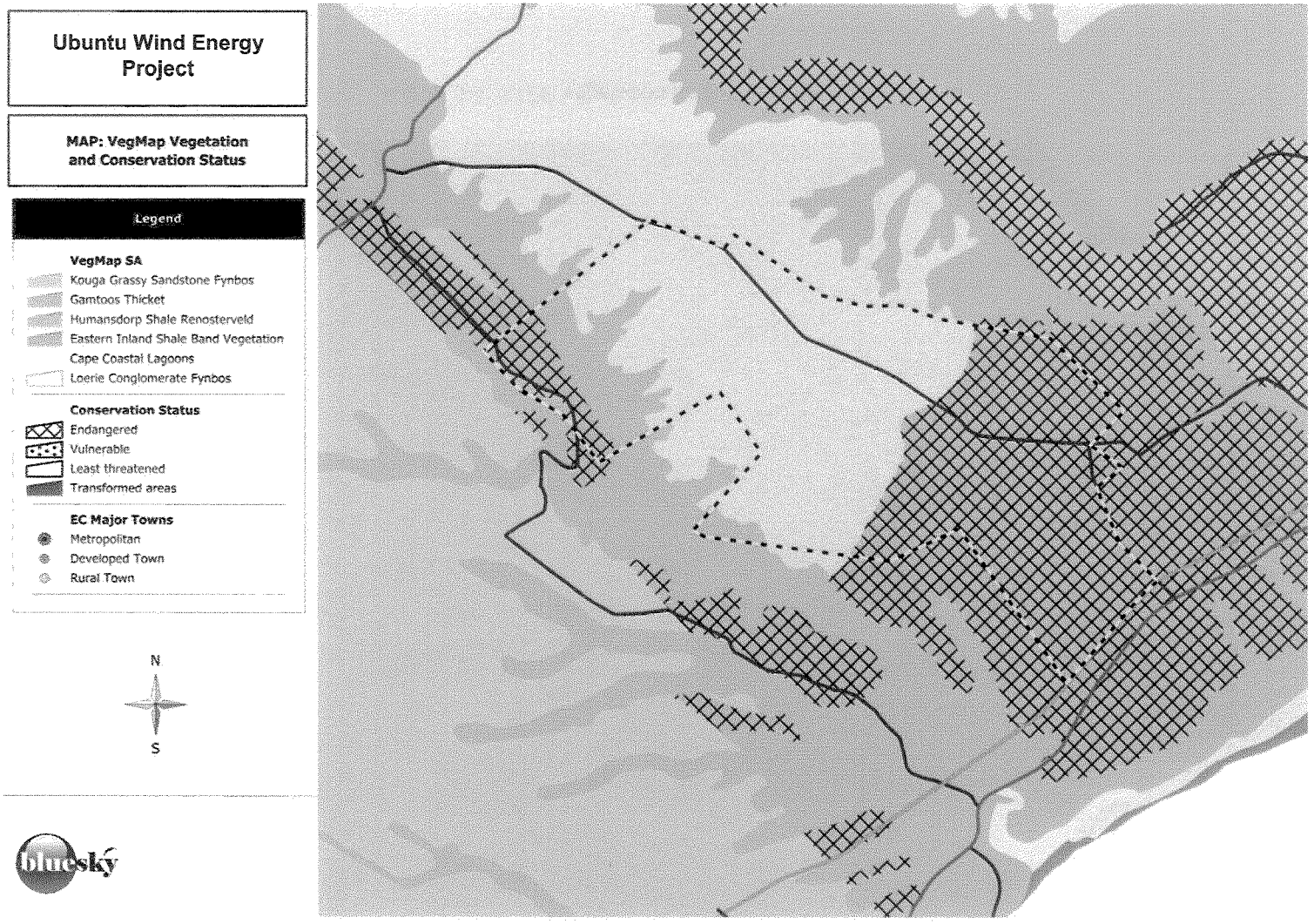


Figure 5-3: VegSA (Mucina & Rutherford) vegetation units and conservation status.

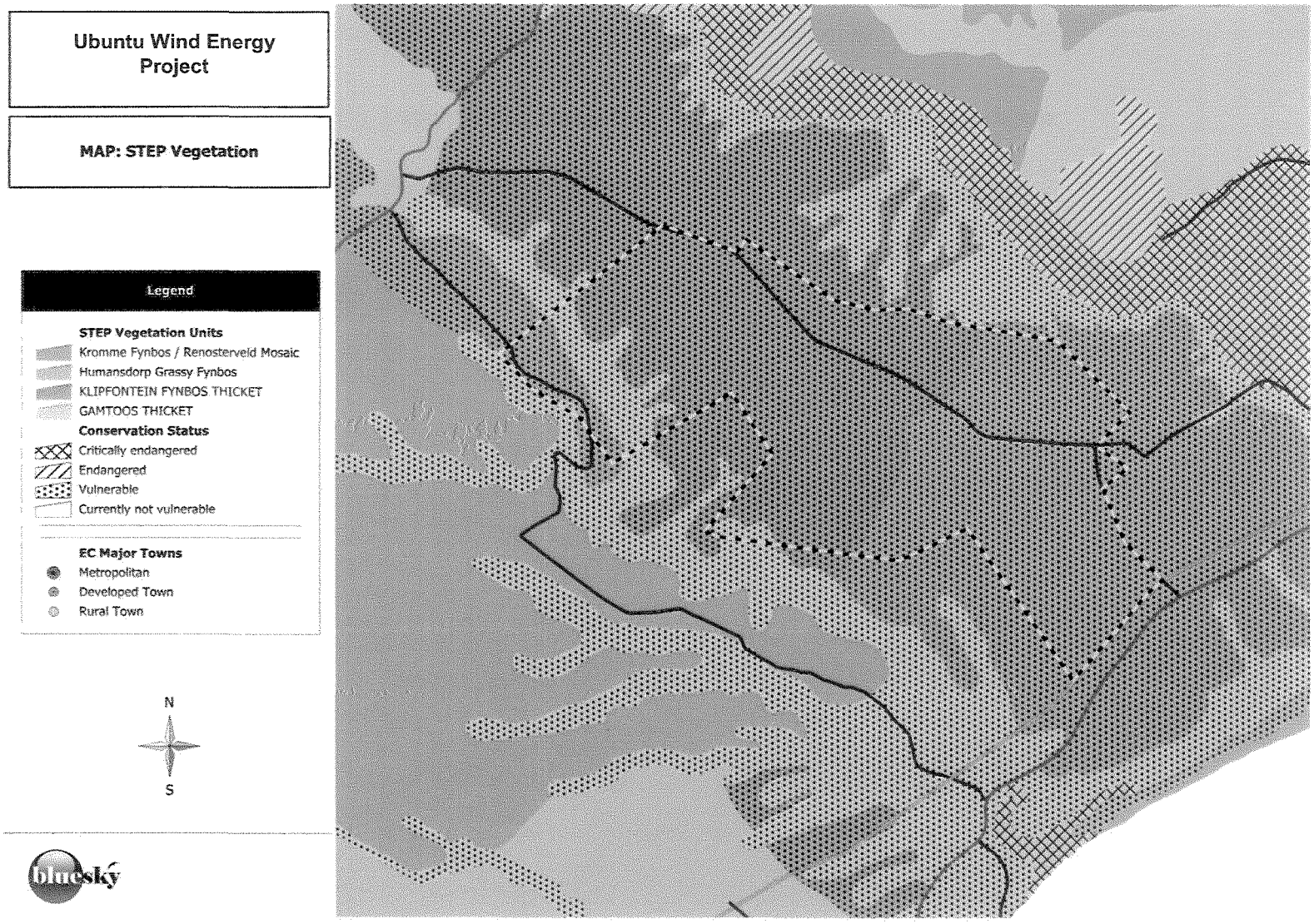


Figure 5-4: STEP vegetation units and conservation status

Table 5.1: Mucina & Rutherford (2006; SAVeg) vegetation classification and Conservation Status.

Vegetation Unit	Conservation Status
Humansdorp Shale Renosterveld	Endangered
Gamtoos Thicket	Least threatened
Loerie Conglomerate Fynbos	Least threatened

Mucina and Rutherford recognise Humansdorp Shale Renosterveld as having an endangered conservation status.

5.3.3.2 Sub tropical Ecosystem Planning

At a *regional* scale STEP provides regional planning guidelines for the Eastern Cape/Western Cape area, where Thicket vegetation occurs. The respective STEP vegetation units and their respective conservation statuses within the proposed wind farm sites are presented in Table 5.2.

Table 5.2: STEP vegetation units and conservation status.

Vegetation Unit	Conservation Status
Gamtoos Thicket	Vulnerable
Kromme Fynbos / Renosterveld Mosaic	Vulnerable
Kabeljous Renoster Thicket	Vulnerable

5.3.3.3 Riparian Zones and Ecological Support Areas

The term "wetland" is a generic term for all the different kinds of habitats where the land is wet for some period of time each year, but not necessarily permanently wet. Water which falls as rain in the catchment and which is not lost to the atmosphere through evaporation or transpiration, moves through the catchment to the sea. Wetlands occur where the landform (topography) or geology slows down or obstructs the movement of water through the catchment (e.g. where it is very flat), or where groundwater surfaces causing the surface soil layers in the area to be temporarily, seasonally or permanently wet. This provides an environment where particular plants (hydrophytes) that are adapted to wet conditions tend to grow in abundance. The plants in turn affect the soil and hydrology (e.g. by further slowing down the movement of water and by producing organic matter that may accumulate in the soil).

Three key features can be used to distinguish wetlands:
Abundance of water: the land is covered by water, or has saturated soil at some time when the soil is biologically active. Saturated soil is that which contains sufficient water for long enough for reduction to occur.
Saturated (reduced) soil: the soil is hydric i.e. the soil has been depleted of oxygen through the chemical process of reduction, which in turn results in the presence of redoximorphic features, e.g. features formed by the process of reduction, translocation and oxidation of iron and manganese.
Hydrophytic vegetation: plant life adapted to growing in saturated soils. Some plants have adapted to life in wetlands and are called hydrophytes (this means that they are "water loving", or rather, anoxia tolerant). These specialized plants have adapted to grow in the anaerobic conditions of hydric soils.

A. Potential Vulnerabilities of, and threats to wetlands

Threats to the wetlands as a result of the proposed development potentially include:

- Introduction to the system of:
  - alien and invasive terrestrial vegetation,
  - aquatic alien vegetation
- Pollution sources affecting water quality and water quantity (stormwater runoff and siltation);
- Development that compromises long-term ecosystem functioning;
- Infilling/direct loss of aquatic habitats;
- Drainage of wetlands;
- Separation from up- and downstream wetland systems - e.g. source areas, seepage lines, drainage corridors;
- Changes in water table (increases and decreases in level and changes in quality);
- Removal or degradation of indigenous vegetation in the system;
- Catchment hardening (loss of catchment habitat and ability to absorb flows, and increased stormwater runoff), encroachment, fragmentation/loss of corridors; and
- Insufficient buffering between existing wetlands and developments.

B. Recommended Management Guidelines

The following guidelines should be implemented and adhered to when impacts to wetlands are likely to occur:

- Flow regimes must be able to maintain the wetland at its present extent and habitat quality, as well as downstream ecosystems;
- Hydrological connections between systems should be preserved;
- Existing ecosystem linkages/connectivity must be maintained at an appropriate scale; and
- Buffers (i.e. building setbacks, preferably natural vegetation) should:
  - protect wetland systems from specific identified threats, as relevant to each system;
  - provide sufficient space to allow for future rehabilitation and buffering of that ecosystem;
  - protect the ecosystem health and integrity of receiving ecosystems.

5.3.4 Description of Vegetation, Flora and Fauna

5.3.4.1 Perceived Reference State (PRS)

A. Gamtoos Thicket

Intact thicket vegetation located in kloofs, incised slopes adjacent to perennial and annual streams and watercourses to upper reaches of drainage lines. Most likely to have been of a climax nature, with pioneer species along the fringes, controlled by fire occurrence on the ecotone within the grassy fynbos and renosterveld vegetation.
Distribution: Eastern Cape Province: coastal basin of the Gamtoos River valley, south of the Baviaanskloof Mountains and along some smaller river valleys such as that of the Kromme River. Also found north of the Baviaanskloof Mountains in more xeric conditions on some low ridges south and southeast of Steytlerville.
Altitude: 0–700 m.
Geology and Soils: Mostly restricted to rocky, sandy-loamy soils derived from shale and sandstone of the Bokkeveld Group (Ceres and Tarka Subgroups) and Table Mountain Group (Nardouw Subgroup) as well as the Jurassic Enon conglomerates. Also found are fairly shallow clayey soils derived from the Gamtoos Group limestone, phyllite and arenite of the Kaan and Klein River Formations (Namibian Erathem).

Vegetation and Landscape Features: On low mountain slopes in steeply sloping areas and on low ridges. Tall, dense thicket, where both the trees and shrubs and the succulent components are well represented. Few distinct strata can be differentiated within much of the vegetation as the lower and upper canopies are intertwined often together with a wide variety of liana species linking the understory species with the canopy. Occurs mostly as a fragmented community with large, dense stands restricted to south- and south-west facing slopes that are protected against fires. The structure of the dense stands of Gamtoos Thicket is similar to that of the Sundays thicket, but it differs in the dominant species.
NSBA Conservation status: Least threatened
NSBA Conservation status: Least threatened. Target 19%. A total of 6% of this vegetation unit is protected in statutory conservation areas: Baviaanskloof Conservation Area, Guerna and Berg Plaatz Wilderness Areas as well as Stinkhoutsberg, Kabeljousrivier, Loerie Dam and Seekoeirivier Nature Reserves. Private conservation areas (Hankey Forest Reserve No. 1, Monteaux Game Ranch, Lombardini Game Farm, Kabeljous River Natural Heritage Site, and Kromme River Mouth, Eastcot and Loerie Dam Nature Reserves) also protect some patches of this vegetation type. Some 12% of Gamtoos Thicket has been altered by cultivation and 1% by urbanisation. The alien *Atriplex lindleyi* subsp. *inflata* has invaded many degraded arid thicket areas, especially on soils with a high clay content. Erosion is variable.

B. Humansdorp Shale Renosterveld:

Intact vegetation as per description above located on lower slopes towards the coast. Most likely to have been elements from this vegetation within the southern portions of the site.
NSBA Conservation status: Endangered
Distribution: Eastern Cape Province: Three swathes: from Jeffrey's Bay and Marina Glades near the coast inland past Humansdorp to the lower reaches of the Dieprivier near Two Streams; the Mondplaas/Mondhoek area near the mouth of the Gamtoos River stretching inland in a series of patches south of the Gamtoos River to west of Patensie; between thicket and fynbos types from Burghley Hills to Rocklands and the Dell to Nooitgedacht southwest of Uitenhage. Coastal forelands from Humansdorp to Port Elizabeth.
Altitude: 20–360 m.
Geology & Soils: Clay and loams derived from the Ceres Subgroup of the Bokkeveld Group shales. Plinthic catenas prominent. Land types mainly Ca and Bb.
Vegetation & Landscape Features: Best developed on loamy soils on open flats, mostly derived from sandstone and shale of the Baviaanskloof Formation but also those of the Ceres subgroup of formations. Characteristic is the abundance of Renosterbos (*Elytropappus rhinocerotis*), often with the grass component (*Themeda triandra*) well developed soon after a fire. Soon after a fire *Aspalathus nivea* also tends to be common here, along with other Fynbos elements (e.g. *Erica glandulosa*), but they are never dominant. Some species (e.g. *Cyrtanthus wellandii*, *Delosperma patersoniae*, and *Gasteria nitida* var. *armstrongii*) are endemic to this unit. Some parts of this may be of recent (< 300 years) origin as landowners seem to use fire to remove the Thicket vegetation to favour the palatable grass component. The subsequent frequent burning and heavy grazing of the grass component probably enabled Renosterbos to increase in density, to become the present dominant species in most of the areas. *Aloe africana* is often abundant in this unit, even in the matrix Renosterveld where it may act as a precursor for Thicket clumps, or alternatively be a remnant of the Thicket clumps.
Conservation: Endangered. Target 29%. None conserved in statutory conservation areas and only 6% enjoys protection on private land (Thaba Manzi and Lombardini Game Farms). Some 61% already transformed (cultivation). Erosion very low and low.

C. Loerie Conglomerate Fynbos

Distribution: Eastern Cape Province: Hankey Valley on both sides of the Gamtoos River, from Andrieskraal to Mondplaas on the south-western side, and Patensie to Thornhill on the north-eastern side. Also found in the lower Kwazunga Valley above Springfield and Rooikrans near Uitenhage. Altitude: 80–400 m.
Geology & Soils: Acidic, mostly clay-loam, Glenrosa and Mispah soils and conglomerates associated with shales and conglomerates of the Karroo Uitenhage sequence.
Vegetation & Landscape Features: Moderately undulating plains dissected by major rivers. Vegetation low shrubland or grassland with sparse emergent tall shrubs, and rich in succulents and geophytes. Structurally these are graminoid, asteraceous and proteoid fynbos types.
NSBA Conservation status: Least threatened. Target 23%. Some 11% statutorily conserved in the Groendal Wilderness Area. Small patches are also found in the private Kabeljous River Natural Heritage Site. About 9% transformed (cultivation). Erosion very variable, including significant areas of high and moderate erosion, but also very low in some areas.

5.3.4.2 Vegetation Communities - Present Ecological State (PES)

A number of distinct vegetation communities are present within the site (Figure 5.5):
A. Shale Renosterveld community;
B. Loerie Conglomerate Fynbos
C. Gamtoos Thicket
D. Seeps, Wetlands and Drainage Lines
E. Transformed vegetation.

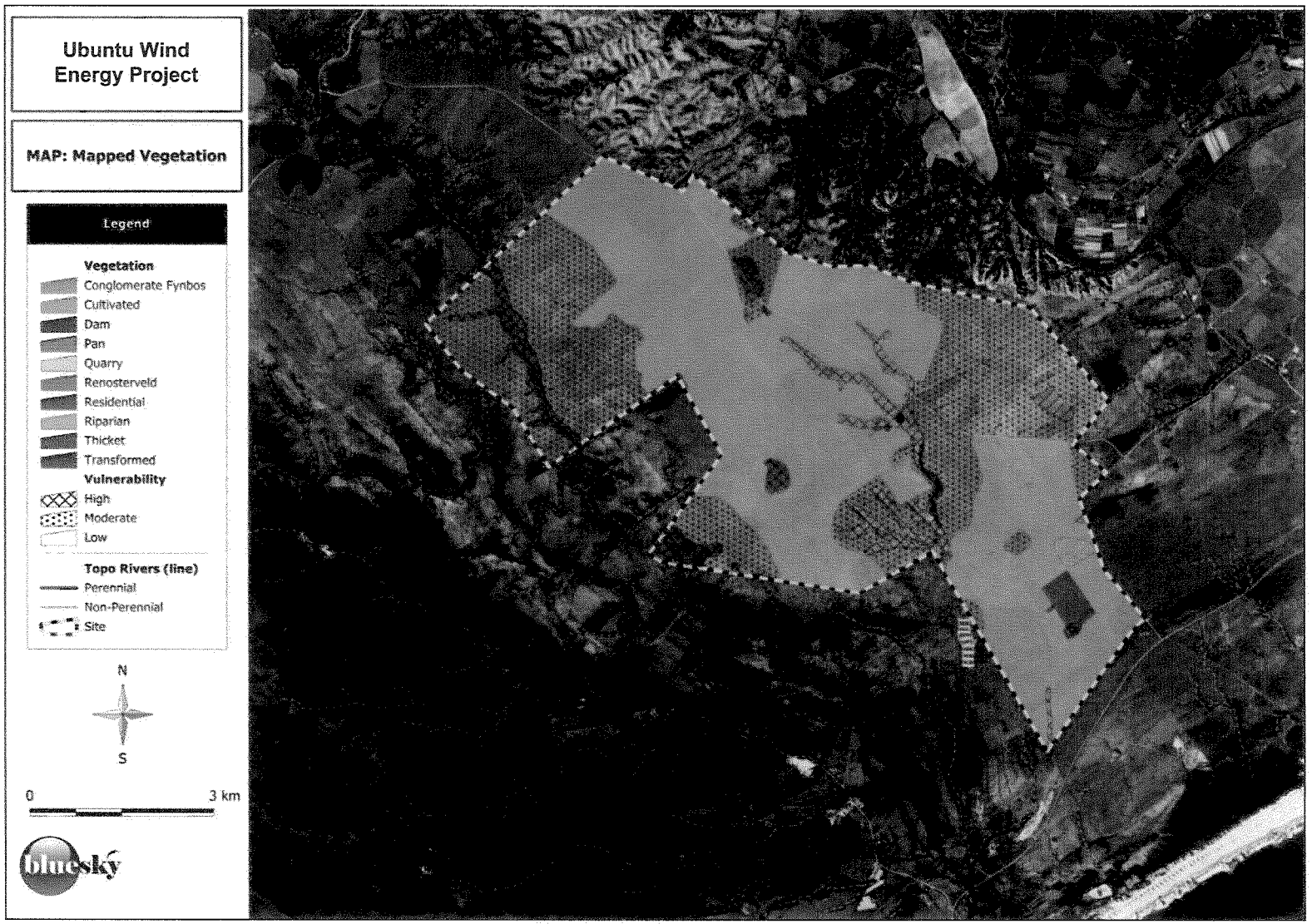


Figure 5-5: Mapped Vegetation communities with respective ecological sensitivity indicated.

A. Shale Renosterveld community

Some elements of this unit (Figure 5-6 to Figure 5-9) are present with *Elytropappus rhinocerotis* dominating degraded areas. Mostly transformed as a result of cultivation. The Renosterveld where not invaded and disturbed or transformed, tends to be typical of the vegetation types. Excessive burning is clearly evident for the majority of this unit within the site. Species diversity becomes very poor and is dominated by a few key fire-resistant species (such as *Bobartia sp.,* and *Watsonia sp.).* The unit tends to be most intact in areas having shallow soil, often associated with or surrounding the distinct rocky refugia (*Metalasia aurea* is a good indicator of these areas). Where intact, it is composed of a mix of small shrubs, herbs, grasses and restios typically less than 50 cm in height. Typical and common species include, but are not limited to, *Agathosma gonaquensis, Bobartia orientalis, Boophone disticha, Clutia alaternoides, Disparago ericoides, Elytropappus rhinocerotis, Erica cerinthoides, Euryops munitus, Gerbera ambigua, Helichrysum anomalum, Ischyrolepis sp., Metalasia densa, Montinia caryophyllacea, Passerina falcifolia, Selago corymbosa, Tephrosia capensis, Thamnochortus sp, Themeda triandra* and *Watsonia pillansii.*

Figure 5-6: Typical regenerating Renosterveld

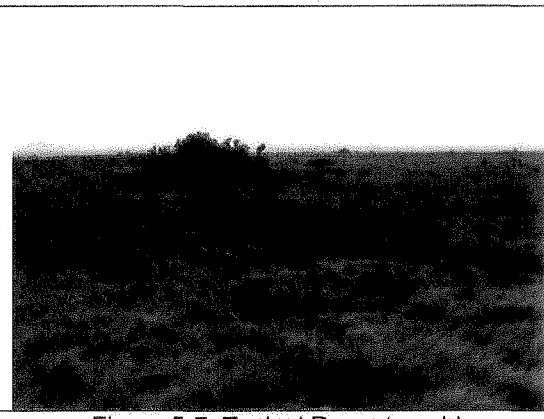


Figure 5-7: Typical Renosterveld

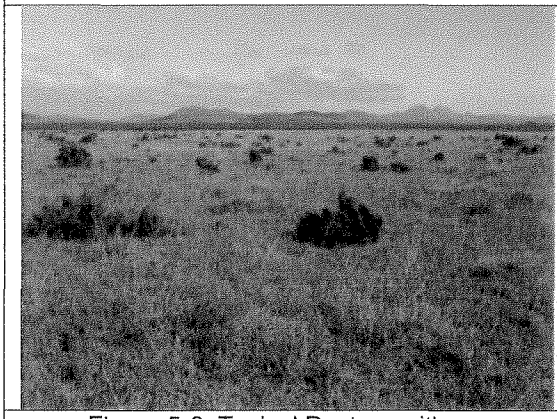


Figure 5-8: Typical Pasture with re-establishment of Renosterveld elements

Figure 5-9: Typical Pasture with return of Renosterveld elements

It provides habitat for a number of protected species. Most of this habitat is likely to be lost to development as per the current development plan. Ecological functioning tends to be disturbed in this habitat, where excessive fire and cultivation/tilling has occurred. The retention of portions

of this within the Open Space Management System is critical to form linkages with outlying areas to the west and east. Disturbance within the area demarcated as intact Grassy Fynbos tends to be minimal, with a few footpaths as well as some light alien infestation being present.

- Community structure varied, dependant on fire and grazing regimes;
- Large areas intact, but degradation evident to varying degrees as a result of historical land-use practices in the area;
- A few severely degraded (non-restorable) portions of this vegetation type are present.

Implications for the proposed windfarm

- Loss of intact vegetation dependant on final layout and limited to footprint of turbines, roads, cables and other infrastructure.
- During micro-siting, intact areas of Fynbos should be retained in favour of more degraded patches or rocky areas, where some fire-protected niches may be present.

B. Loerie Conglomerate Fynbos

The Conglomerate Fynbos (Figure 5-10 to Figure 5-13) where not invaded and disturbed or transformed, tends to be typical of the vegetation types. The unit tends to be most intact in areas having distinctly shallow, stony soils soil. Where intact, it is composed of a mix of small shrubs, herbs, grasses and restios typically less than 50 cm in height. *Metalasia densa* and *Metalasia aurea* are good indicators in this unit, which tends to be adapted to habitats where soils are shallow and fire tends to be excluded. Typical and common species include, but are not limited to *Erica pectinifolia, Leucadendron salignum, Leucospermum cuneiforme, Berkheya heterophylla, Helichrysum spp., Indigofera spp., Hibiscus spp., Hermannia spp., Gerbera spp., Ledebouria ensifolia, Morella serrata, Oedera genistifolia, Selago corymbosa, Senecio spp., Passerina falcifolia. Clutia sp., Disparago ericoides, Elytropappus rhinocerotis, Ischyrolepis sp., Montinia caryophyllacea, Passerina falcifolia, Selago corymbosa, Ledebouria ensifolia* and *Themeda triandra. Some typically thicket elements also occur, including Diospyros dichrophylla, Euclea crispa, Grewia occidentalis* and *Scutia myrtina.*

Figure 5-10: Typical Conglomerate Fynbos (northern site).

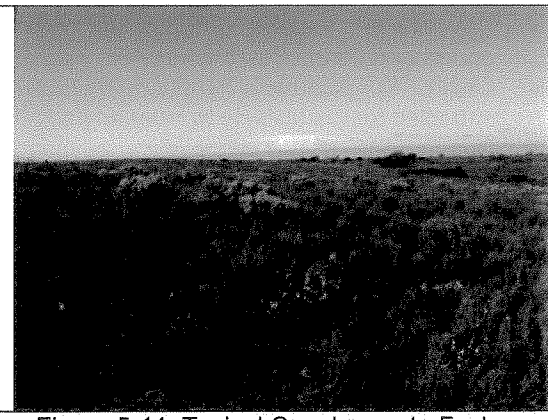


Figure 5-11: Typical Conglomerate Fynbos (northern site).

Figure 5-12: Typical Conglomerate Fynbos (southern site).

Figure 5-13: Typical Conglomerate Fynbos (close-up).

It provides habitat for a number of protected species. Minimal loss of this habitat is likely to occur should the current development plan alternatives be implemented. Ecological functioning tends to be largely intact in this habitat where excessive fire and cultivation/tilling has not occurred. The retention of portions of this within the Open Space Management System is critical to form linkages with outlying areas to the west and east. Disturbance within the area demarcated as intact Conglomerate Fynbos tends to be minimal with a few footpaths as well as some light alien infestation being present.

- Community structure varied, dependent on fire and grazing regimes;
- Large areas intact, but degradation evident to varying degrees as a result of historical land-use practices in the area;
- A few severely degraded (non-restorable) portions of this vegetation type are present.

Implications for the proposed windfarm

- Loss of intact vegetation dependant on final layout and limited to footprint of turbines, roads, cables and other infrastructure.
- Loss of Conglomerate Fynbos is restricted to a few sites outside of cultivated areas and the expected loss is unlikely to have any significant impact at a regional level.
- During micro-siting, intact areas of Conglomerate Fynbos should be retained in favour of more degraded patches or rocky areas, where some fire-protected niches may be present..

C. Gamtoos Thicket

Intact thicket vegetation (see Section 5.3.4.1 A) remains in kloofs, incised slopes adjacent to perennial and annual streams and watercourses. This unit is in a largely natural state although infestations by *Acacia mearnsii* are present and the original vegetation has been lost through direct clearing and in areas flooded by dams. The thicket (Figure 5-14 & Figure 5-15) tends to be limited to slopes around drainage lines, with some pockets in fire protected areas within the grassy fynbos mosaic.

Figure 5-14: Typical Gamtoos Thicket

Figure 5-15: Typical Gamtoos Thicket

Typical Gamtoos Thicket elements are common and include: *Abutilon sonneratianum, Allophylus decipiens, Aloe africana, Aloe ferox, Aloe speciosa, Apodytes dimidiata, Aristida congesta, Asparagus spp., Azima tetracantha, Cotyledon orbiculata, Cotyledon campanulata, Cussonia thyrsiflora, Ehretia rigida, Euclea racemosa, Euclea undulata, Euphorbia grandidens, Euphorbia triangularis, Gasteria nitida, Gymnosporia capitata, Gymnosporia spp., Hippobromus pauciflorus, Jasminum angulare, Lauridia tetragona, Maerua cafra, Mystroxylon aethiopicum, Olea europaea subsp africana, Pappea capensis, Pittosporum viridiflorum, Ptaeroxylon obliquum, Pterocelastrus tricuspidatus, Rhus incisa, Sansevieria hyacinthoides, Schotia afra var afra, Scolopia zeyheri, Tarchonanthus camphoratus, Grewia occidentalis, Scutia myrtina and Sporobolus africana*

Implications for the proposed windfarm

- Loss of intact vegetation dependent on the final layout and limited to the footprint of the turbine towers, roads, cables and other infrastructure and likely to be very limited within the site.
- Preferably, since Thicket clumps tend to be sparse and provide a specialised habitat within the grassy matrix, these clumps should be avoided during final micro-siting.

D. Seeps, Wetlands and Drainage Lines

The seasonal wetlands (Figure 5-16 to Figure 5-19) can be distinguished by having a variety of short grasses present. No species of special concern were noted to be present within the pans.

Figure 5-16: Typical Riparian Seep along a drainage line with short seasonal grasses

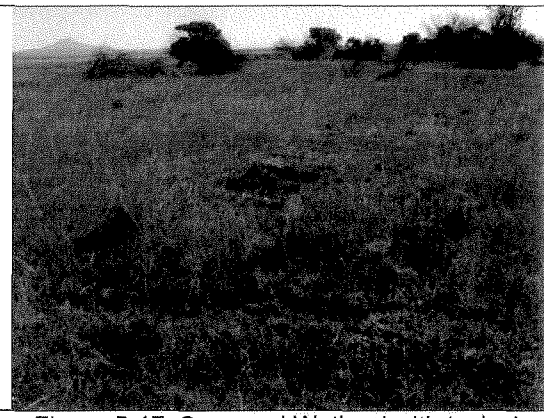


Figure 5-17: Seasonal Wetland with typical seasonal grasses dominating

Figure 5-18: Seasonal Wetland situated in the middle of the site with isolated bushclumps around its periphery

Figure 5-19: Excavated dam within a large wetland situated in the middle of the site

Typical grass species include: *Cynodon dactylon, Ehrharta calycina, Eragrostis capensis, Ficinia sp., Melinis repens, Panicum maximum, Pennisetum clandestinum, Sporobolus africana, Stenotaphrum secundatum and Themeda triandra.*

Implications for the proposed windfarm

- Loss of intact vegetation dependent on the final layout and limited to the footprint of the turbine towers, roads, cables and other infrastructure.
- Changes to water regimes may alter species composition in the long term.

E. Transformed vegetation.

The transformed areas (Figure 5-20 to Figure 5-23) in the site tend to have a low biodiversity (predominantly grasses and some herbs) often with a moderate to high density of alien species and are thus of limited conservation importance and most suited to be used for development.

Figure 5-20: Transformed area around homesteads with some trees (regenerating thicket clumps and introduced species).

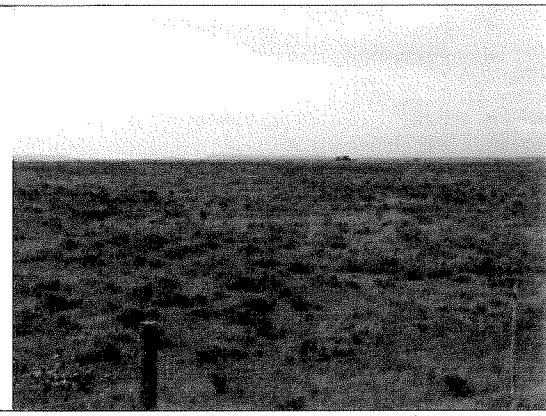


Figure 5-21: Cultivated land with some regeneration of shrub elements

Figure 5-22: Typical pastures dominating the majority of the site

Figure 5-23: Extensive transformed pastures throughout the site

Typical grass species include *Digitaria sp., Pennisetum clandestinum, Stenotaphrum secundatum* and *Themeda triandra. P*rotected species were however noted within the disturbed areas, mostly common widespread species, which are conducive to relocation.

- The areas adjacent to the drainage lines are however important in terms of drainage and the ecological corridor and buffer areas should be retained even if transformed.
- A few severely degraded (non-restorable) and transformed areas are present along associated with pastures and farming infrastructure.

Implications for the proposed windfarm

- Areas where the footprint of the turbine towers, roads, cables and other infrastructure are located within transformed areas will have minimal loss of natural vegetation cover.

5.3.4.3 Terrestrial Habitat Vulnerability Assessment Method

An overall vulnerability assessment incorporating key vegetation and ecological indicators (summarised in Table 5.3) was made and includes the following key criteria:

- Relative levels of *intactness* i.t.o. overall loss of indigenous vegetation cover;
- Presence, diversity and abundance of *species of special concern* (weighted in favour of local endemic species);
- Extent of *infestation* (severity and overall ecological impact), as well as the degree to which successful rehabilitation could take place;
- Overall degradation incorporating above factors; and
- Relative importance of the vegetation communities relative to their regional conservation status - indicated as vulnerability of the area as a result of loss.

Intactness

Three basic classes are differentiated:

- **Low**: < 25 % of original vegetation has been removed/lost; and/or no species of special concern present that are critically endangered, endangered or having highly localised endemicity.
- **Moderate**: 25 - 75 % of original vegetation has been removed/lost; and or species of special concern present but not having high conservation status or high levels of endemicity.
- **High**: > 75 % of original vegetation has been removed/lost; and/or presence of species with a highly endemicity and/or high conservation status (endangered or critically endangered).

Alien Infestation

Three classes are differentiated:

- **Low**: no or a few scattered individuals of alien species;
- **Moderate**: individual clumps of invasive species present, but cover less than 50% or original area;
- **High**: dense, impenetrable stands of invasive species present, or cover > 50 % of area with substantial loss functioning. Rehabilitation will most likely require specialised techniques over an extended period (> 5 years).

Degradation

Overall degradation is determined from the above alien infestation and intactness scores according to the following matrix:

Intactness	**Infestation**		
	Low	**Moderate**	**High**
High	Pristine	Near Pristine	Moderately Degraded
Moderate	Near Pristine	Moderately Degraded	Severely Degraded
Low	Moderately Degraded	Severely Degraded	Transformed

Overall Sensitivity score

Overall sensitivity of the vegetation within the site is calculated according to the following matrix which combines degradation and overall conservation status of the vegetation units of the site.

Degradation	**Conservation Status**			
	Least threatened	**Vulnerable**	**Endangered**	**Critically Endangered**
Severely degraded/ Transformed	Low	Low	Moderate	Moderate - High
Moderately degraded	Low	Moderate	High	High
Ecologically Pristine or near Pristine	Moderate	Moderate - High	High	Very High (No-Go area)

- Areas scoring an overall low sensitivity are those areas that are:
  - highly degraded or transformed and it is unlikely that they could be rehabilitated to a normal functioning state without extreme effort and expense.
  - includes areas that have a low conservation status.

- *This includes the portions of the site that are associated with homesteads and cultivated areas and pastures, or where there is very dense alien infestation. Loss of these areas will furthermore not significantly compromise the current conservation status of the vegetation unit.*

- Areas scoring an overall moderate sensitivity are those areas that:
  - contain a reasonably intact habitat;
  - have moderate, low or no alien infestation,
  - a *Vulnerable* or lower conservation score and with minimal loss of ecological functioning.

  - *On site the intact portions of Humansdorp Shale Renosterveld and Loerie Conglomerate Fynbos tend to have a moderate sensitivity score.*

- Areas scoring an overall high sensitivity are those having:
  - an important ecological function (including ephemeral wetland pans) , having specialized habitats (rocky outcrops with associated specialised flora and/or fauna) or steep slopes;
  - a critically endangered conservation status or an endangered conservation status where ecological processes have not been irreversibly compromised.
  - *High sensitivity areas would include wetlands, seeps and riparian areas, which although have a low regional conservation status provide a specialised habitat that is absent from the surrounding general vegetation units. Intact Thicket clumps have also been scored as having a High Sensitivity as they tend to be isolated islands and have an important ecological function in the general area.*

5.3.4.4 Ecological Indicators

A summary of key Present Ecological State indicators for the area are presented in Table 5.3 below. Since historical data are lacking some assumptions have been made where necessary.

Table 5.3: Present Ecological State indicators of the study area.

Aspect	Description
Landscape Description	
Aspect, Slope, Topography	Depending on position relative to drainage lines (which run in a southerly direction) the sites are relatively flat to gently undulating plateaux surrounded on the east and west with deeply incised valleys
Substrate	Quartzite and sandstone
Community Description	
Vegetation units	Humansdorp Shale Renosterveld on undulating plateaux and Gamtoos Thicket along slopes of incised drainage lines; Humansdorp Shale Renosterveld varies in composition from a shrubby composition on shallow-soil and rocky hilltops with a grassy component in valleys and seep areas where soils are deeper and wetter. Loerie Conglomerate on slopes where rocky exposed soils are present.
Total Cover (%)	± 95 % (remainder includes dams, excavations and areas where bare soil is present (i.e. outcrops)
Tree Canopy Cover (%)	< 5 % (thicket plus some scattered invasives)
Shrub Cover (%)	± 10 % (within Fynbos and Renosterveld)
Herb Cover (%)	± 20 %
Grass Cover (%)	> 60 % (includes pastures)
Bare soil/rock (%)	< 5 % (includes outcrops, dams and excavated areas)

Aspect	Description
Estimated Tree Height (m)	< 5 m (excluding alien and exotic species around residences)
Disturbances, current land uses and sources of degradation	
Human disturbances/impacts	Cattle grazing and cultivation related disturbances, pastures, excavations, dams, roads, dwellings and other buildings
Habitat fragmentation	Extensive in pasture areas and relating to existing gravel roads and dams along drainage lines and seeps and fenced areas where some constraints on faunal movement may occur.
Invasive Alien Plants	Some isolated clumps present, predominantly *Acacia spp.,* but largely insignificant in extent and proliferation.
Relative remaining intact habitat:	Areas largely transformed, with managed pastures accounting most of the site
Grazing (livestock)	Site used extensively for cattle grazing, but at low density
Hunting	None evident
Conservation (flora)	No formalised conservation within the site, but fenced game farm present.
Wetlands/Seeps	Dominated by grasses and herbaceous species with sedges and other facultative wetland species. Wetlands and seep areas are extensive and will be dealt with in a separate wetland specialist report.
Recreational (sport)	None observed
Sensitivities	
Conservation importance	Moderate to Low for Loerie Conglomerate Fynbos and Humansdorp Shale Renosterveld and Moderate to High for Gamtoos Thicket
Topography	Topography relatively flat to gently undulating, with deeply incised drainage lines running towards the south and east.
Rehabilitation potential	Rehabilitation after disturbance highly possible, where loss of topsoil is not extensive.
Community structure	Excessive fire, cultivated pastures and historical grazing has impacted community structure. Some degradation indicators present.
Flora	Natural indigenous vegetation with some pastures and transformed areas.
Fauna	Some reptiles present in outcrops indicated as being of special concern as per faunal recommendations. Amphibians associated with wetlands and seeps and may migrate during rainfall periods.
Indigenous Species of Special Concern	See Table 5.4 above for list
Alien invasion	Few scattered clumps aliens throughout the area, tending to be non-invasive when occurring.
Ecological Processes	
Coastal dunes	None present on the site
Climatic gradients	None present on the site
Drainage Lines/ Riparian Vegetation	Important from an ecological process perspective within rivers and associated drainage lines. Riparian vegetation present in seeps and wetlands and associated with dams.
Refugia	Distinct rocky outcrops present and abundant on hilltops and along ridges along incised drainage lines. Provides habitat for floral and faunal species of special concern. Whilst relatively abundant on site the total refugia habitat is limited in extent and distribution.
Fire	The frequency of fires has probably changed significantly in relation to the PRS. The frequency of fires in the study area is unknown, but expected to be relatively frequent in grassland and grassy fynbos vegetation. Changes to community structure are evident due to excessive fire, with indicators of excessive fire evident throughout the site and extensive in places.
Ecotones/Tension zones	Habitat fragmentation (pastures and roads) has increased the area covered by ecotones in relation to the PRS
Erosion	Serious erosion largely absent due to levelness of the site, some surface erosion evident around severely disturbed areas especially dams
Carbon storage	Grassland and Fynbos/Renosterveld is a moderate to low carbon accumulator; Thicket is a moderate to High carbon accumulator
Medicinal plants	No medicinal species were noted in abundance, but some species occurring have been recorded for medicinal uses.

Aspect	Description
Food	The value of the study area as a source of food is expected to be insignificant, with food plants being limited to a few tree species. Extensive loss of indigenous vegetation cover would have been accompanied by loss of indigenous food plants
Fuelwood (availability)	No collection observed, although bush clearing would have generated wood which may have been used historically
Building materials	None evident, trees largely confined to ravines
Grazing	Cattle present with a history of sheep farming (Stocking density moderate to high so grazing impact tends to be significant)
Barriers to gene dispersal	The erection of fences and roads will prevent the movement of some fauna (terrestrial) and hence plant propagules (i.e. as their agents of dispersal)
Corridors for gene dispersal	Fences and utility structures (e.g. transmission lines, telephone lines) that act as perches for birds may be viewed as corridors for bird mediated seed dispersal. These may not follow the dispersal routes in the PRS (e.g. ridges, drainage lines) and increase dispersal of certain species (bird dispersed thicket pioneers)
Conservation importance	
Current Distribution (extent)	Loerie Conglomerate Fynbos is relatively widespread in the region, Gamtoos Thicket is also widespread, but restricted to kloofs and river valleys. Humansdorp Shale Renosterveld tend to be transformed and degraded through agricultural activities.
Relative Conservation importance	Loerie Conglomerate Fynbos and Humansdorp Shale Renosterveld vegetation has a low local conservation importance where intact, Gamtoos Thicket has a moderate to high local conservation importance. tend to be transformed and degraded through agricultural activities.
Overall Intactness	Excessive runaway fire and land management (cultivation, grazing and burning) have altered the unit from the PRS, and besides localised areas and specialised habitats, the general vegetation is transformed and degraded rather than intact.

5.3.4.5 Floral diversity

A total of **218** plant species was recorded within the site (for complete species list see Appendix 5.1). Field sampling was undertaken in the late summer and autumn (January and May 2011), but it was completed at the end of a particularly dry spell and may not be comprehensive in that certain plants are only visible for short periods of time during the year. This, however, is unlikely to be a significant issue since sites should be surveyed before construction and micro-sited should it be necessary to avoid any populations of SSC found to occur that could be deemed to be of significant conservation importance.

A. Protected Flora

Thirty six protected plant species occurred within the site (Table 5.4). Most of the species are widely distributed and it is unlikely that the proposed development would have any significant impact on populations. It is however strongly recommended that individuals of *Cyrtanthus obliquus*, *Delosperma ecklonis, Erepsia aristata* and *Gasteria pulchra* be rescued and relocated before construction commences.

Table 5.4: Indigenous Species of Special Concern.

Botanical Name*	Family	Status**	Regional Distribution/ Endemism*	Distribution within the site
Aloe africana	Asphodelaceae	PNCO	Regionally Widespread and Common	Fynbos/ Renosterveld, Thicket
Aloe speciosa	Asphodelaceae	PNCO	WC, EC	Thicket
Asparagus aethiopicus	Asparagaceae	PNCO	Namaqualand to Transkei	Thicket
Asparagus capensis	Asparagaceae	PNCO	Namibia to Transkei	Fynbos/ Renosterveld
Asparagus racemosus	Asparagaceae	PNCO	Widespread	Thicket
Asparagus striatus	Asparagaceae	PNCO	WC, EC, FS	Thicket
Bobartia orientalis	Iridaceae	PNCO	Widespread	Fynbos/ Renosterveld
Boophone disticha	Amaryllidaceae	PNCO	Southern Africa, East Africa	Widespread and common in intact outcrops
Bulbine frutescens	Hyacinthaceae	PNCO	Widespread	Fynbos/ Renosterveld
Chasmanthe aethiopica	Iridaceae	PNCO	EC, WC	Fynbos/ Renosterveld
Cyrtanthus obliquus	Amaryllidaceae	PNCO	Humansdorp, PE	Fynbos/ Renosterveld, outcrops
Delosperma ecklonis	Mesembryanthemaceae	PNCO	Humansdorp, Uitenhage	Fynbos/ Renosterveld, outcrops
Disa sp.	Orchidaceae	PNCO		Fynbos/Renosterveld, outcrops
Erepsia aristata	Mesembryanthemaceae	PNCO	Humansdorp, Baviaanskloof, endemic	Fynbos/Renosterveld,
Erica cerinthoides	Ericaceae	PNCO	Widespread, EC, WC	Fynbos
Erica pectinifolia	Ericaceae	PNCO	Widespread, EC, WC	Fynbos
Gasteria pulchra	Asphodelaceae	PNCO	Hankey, Humansdorp	Fynbos/ Thicket, outcrops
Gladiolus longicollis	Iridaceae	PNCO	Widespread	Fynbos/ Thicket, outcrops
Haemanthus sp.	Amaryllidaceae	PNCO		Fynbos/ Thicket, outcrops
Hypoxis angustifolia	Hypoxidaceae	PNCO	Widespread	Fynbos/ Thicket, outcrops
Ischyrolepis sp	Restionaceae	PNCO	Widespread	Fynbos/ Thicket
Ledebouria ensifolia	Hyacinthaceae	PNCO	Widespread	Fynbos/ Thicket
Leucadendron salignum	Proteaceae	PNCO	Widespread	
Ornithogalum longibracteatum	Hyacinthaceae	PNCO	Widespread	Fynbos/ Thicket
Pelargonium reniforme	Geraniaceae	PNCO	Widespread	Thicket, Fynbos
Pittosporum viridiflorum	Pittosporaceae	NFA	Widespread	Thicket
Protasparagus densiflorus	Asparagaceae	PNCO	Widespread	Fynbos/ Renosterveld
Protea neriifolia	Proteaceae	PNCO	EC, WC	Fynbos
Romulea minutiflora	Iridaceae	PNCO	WC, EC	Fynbos/ Thicket
Satyrium membranaceum	Orchidaceae	PNCO	Widespread	Fynbos/ Thicket, outcrops
Schotia afra var afra	Fabaceae	NFA	Widespread	Thicket
Sideroxylon inerme	Sapotaceae	NFA	Widespread	Thicket
Thamnochortus sp	Restionaceae	PNCO	Widespread	Fynbos/ Renosterveld

Botanical Name*	Family	Status**	Regional Distribution/ Endemism+	Distribution within the site
Watsonia pillansii	Iridaceae	PNCO	Widespread	Fynbos/Renosterveld
Watsonia pillansii	Iridaceae	PNCO	Widespread, EC, WC	Fynbos/ Renosterveld, outcrops

*Highlighted Species are cited as being endemic to the vegetation unit; ** PNCO Protected by the Provincial Nature Conservation Ordinance; NFA Protected by the National Forests Act of 1998; +EC - Eastern Cape, WC - Western Cape, KZN - Kwazulu-Natal

B. Removal of plants on site for rehabilitation purposes

Conservation worthy/ horticulturally valuable plant species within areas to be cleared that are able to survive translocation, and as indicated by a suitably qualified and trained botanical specialist, must be removed prior to site clearing for later use for rehabilitation purposes. The person or organisation responsible for the relocation of these species must work in advance of the vegetation clearing team, and locate as well as relocate individual plant specimens. Removed plants must be excavated by hand in such a way that the plants, especially the roots are not damaged. Plants can be planted out temporarily either in plastic bags or in-situ in an area that is not affected by the proposed development. Should bags be used, they must be large enough to contain the entire plant's root system. Bags must be filled with local top soil material. Plants should be watered regularly, protected from damage and otherwise maintained to ensure healthy growth. On completion of the civil work plants should be re-planted out in scattered clumps at areas on the site to be rehabilitated as directed by the Environmental Control Officer (ECO).

Individuals of all removed species will need to be housed in a nursery until such time as relocation areas have been identified.

C. Invasive Flora

Three invasive alien plant species were present within the sites (Table 5.5), but not in great abundance. It is recommended that they are removed and/or poisoned to prevent spread into adjacent areas. For a complete species list see Appendix 5.1

D. Eradication protocol

Specific eradication and management procedures must be stipulated in the EMP as to the methods to be implemented to remove and control the various alien invasive plant species as they tend to require species-specific techniques. Introduced weed species do not require removal but management is advised to prevent proliferation as a result of disturbance (i.e. on road verges, etc).

Table 5.5: Alien Invasive plants and common weeds present and CARA classification.

Botanical Name	Common name	Family	Category*	Extent
Acacia cyclops	Rooikrantz	Mimosoideae	CARA 2	Scattered individuals/clumps
Acacia mearnsii	Black Wattle	Mimosoideae	CARA 2	Scattered individuals/clumps
Pinus spp.	Pine	Pinaceae	CARA 2	Homesteads

* **CARA 1**: Declared Weed; **CARA 2:** Declared Invader; see Appendix B.1 in EMP, Section B of this EIA Report for removal requirements.

5.3.4.6 Fauna

The faunal diversity of the central and western regions of the Eastern Cape, including Humansdorp and Jeffrey's Bay, is relatively well-known. However, this diversity has been affected by the long history of human impact in the region and the currently degraded state of much of the area surrounding the study sites. The proposed development involves actions that will compound this transformation.

The faunal assessment provides a review of the surviving terrestrial fauna and its diversity, the presence of threatened species and those of special concern, and the habitat associations of the species

A. Amphibians

Amphibians are an important and often neglected component of terrestrial vertebrate faunas. They are well represented in sub-Saharan Africa, from which approximately 600 species have been recorded (Frost 1985). Currently amphibians are of increasing scientific concern as global reports of declining amphibian populations continue to appear (Mccallum, M.L. 2007) ; and references therein). Although there is no consensus on a single cause for this phenomenon, there is general agreement that the declines in many areas, even in pristine protected parks, are significant and do not represent simple cyclic events. Frogs have been aptly called bio-indicator species whose abundance and diversity is a reflection of the general health and well-being of aquatic ecosystems. They are important components of wetland systems, particularly ephemeral systems from which fish are either excluded or of minor importance. In these habitats significantly, they are dominant predators of invertebrates, many of which may affect humans (e.g. as vectors of disease).
Diversity: Amphibians are the least diverse or species-rich group of terrestrial vertebrates in the region, where 15 species may occur.
Conservation status: No threatened amphibians or SSC have been recorded on the development site.
Alien and extralimital species: No alien or extralimital amphibian species are known in the region.
Habitat associations: The species are mostly associated with temporary and permanent water bodies and only the Bushveld Rain Frog (*Breviceps adspersus*), a terrestrial breeder independent of standing water for reproduction, is probably widely distributed throughout the fynbos habitat.

B. Reptiles

Of 421 reptiles recorded from South Africa, at least 144 occur in the Eastern Cape (Branch, 1998, plus subsequent studies). This diversity is greater than that of Western Europe, and reptiles form an important component of vertebrate diversity within the Province. They also have low mobility and high habitat specificity, particularly lizards and tortoises.
Diversity: Reptile diversity in the region is high, with 61 species known or likely to occur (Branch, 1988a; Branch 1998). This includes 28 snakes, 28 lizards, and 4 chelonians (Appendix 5.2 for a detailed list). They represent almost a third of all reptiles recorded from the Eastern Cape. The recent discovery of new populations of the critically endangered Elandsberg Chameleon (*Bradypodion teaniabronchum*) from the Zandriver Conservation area near Thyspunt (Burger per. comm.), emphasizes the need for more surveys in the area and to understand the ecology of these species. Commonly occurring reptiles are likely to include Puff Adders (*Bites arientans*), Brown House Snake (*Lamprophis capensis*), Cross Marked Sand snake (*Psammophis crucifer*), Cape Girdled lizard (*Cordylus cordylus*) and Red-sided Skink (*Tetradactylus homalocephala*)

Conservation status: Two species (nl. *Scelotes anguineus, Tetradactylus fitzsimonsi*) are endemic to the Eastern Cape Province and of potential conservation concern, have ranges that extend into the coastal region. The only species of major concern for the area is FitzSimons Long-Tailed Seps (*Tetradactylus fitzsimonsi*), an elongate, almost legless terrestrial gerrosaurid that is endemic to coastal fynbos habitats from Oyster Bay to Bridgemead. Its conservation status is Vulnerable.
Seven reptile species are also listed in CITES Appendix II, including monitors (*Varanus albigularis* and *V. niloticus*), one girdled lizard (*Cordylus cordylus*), three tortoises (*Stigmochelys pardalis, Homopus areolatus,* and *Chersina angulata*), and a chameleon (*Bradypodion ventrale*). All are common throughout much of the region, and/or further afield, and all are well protected in existing conserved areas with no evidence of illegal or unsustainable exploitation in the region. Their inclusion on CITES Appendix II is a precautionary measure covering all members of groups that are regularly involved in the international skin (monitor lizards) or pet trade (tortoises, chameleons and girdled lizards).

Alien and extralimital species: A number of reptiles have extended their ranges into the Eastern Cape, probably as a result of being transported during household removals and plant nursery deliveries. These include:
The nocturnal tropical house gecko (*Hemidactylus mabouia*) which is well established in numerous coastal towns (Port Elizabeth, Port Alfred, East London, etc), having expanded its range southwards from northern KwaZulu-Natal since 1960 (Bourquin 1987).
The diurnal Cape dwarf day gecko (*Lygodactylus capensis*) which is also expanding its range in the region, and established populations are known in Port Elizabeth and Grahamstown. It has also recently been observed in the Addo Elephant National Park (Branch unpubl. obs.), as well as in George. It was previously restricted to the Lowveld region and northern KwaZulu-Natal.

Habitat associations: The majority of reptiles within the region are associated with the the fynbos habitat, although some (e.g. the burrowing skinks) are particularly associated with sandy patches. No reptile is linked solely to wooded habitats, although a number of arboreal species (e.g. Southern dwarf chameleon, Tasman's girdled lizard, and boomslang) may utilize forest edges or clearings.

C. Mammals

Despite the emphasis placed on large mammals in the conservation literature they make up less than 15 percent of the total mammal diversity in South Africa. The majority of mammals are small or medium-sized, with rodents being the most successful of all living mammals. Swanepoel (1988) noted that of 292 terrestrial mammal species in southern Africa, 128 (44%) were recorded from the Eastern Cape. Although these figures are now out of date they do demonstrate the mammalian diversity of the Province. Few of the large and medium-sized mammals that previously occurred in the region now occur naturally in the wild. Most are locally extinct or occur in small, fragmented populations usually in forest reserves or in protected areas. Species that have been extirpated within historical times in the Eastern Cape include the cheetah, hunting dog, hippopotamus, lion, red hartebeest and warthog. Most have been extensively re-introduced into provincial and private game reserves. The warthog has escaped from many reserves and threatens to become a problem animal in some areas. Among the medium- to large-sized mammals, buffalo are restricted to reserves, whilst reedbuck, brown hyena, spotted hyena, leopard and serval are extremely rare in the wild.

Diversity: A number of the species formerly recorded or expected to have occurred in the area are now extinct regionally but have been re-introduced to nearby reserves, viz. African Elephant (*Loxodonta africana*), Brown Hyena (*Hyaena brunnea*), Eland (*Taurotragus oryx*), Hippopotamus (*Hippopotamus amphibius)* and Lion (*Panthera leo*).

Over 39 mammal species are known from, or may possibly occur, in the region (Appendix 5.2). This does not include all the bats species, of which approximately another 6/7 species could occur in the region.

Conservation status: The SA Red Data Book Mammals (Friedmann & Daly 2004) revealed that of 295 mammal taxa assessed only 57 (19.3%) were considered threatened. The most sensitive groups were the Insectivores where 42.4% of all taxa (33) were threatened. Moreover, a further four were Near Threatened and no less that 14 were Data deficient. Thus over half (54.4%) of the insectivores were of conservation concern and only one was considered of Least Concern. This contrasts with the more visible large mammal fauna where only 28.9% of 38 carnivore species and only 24% of 33 antelope species were of conservation concern. The significance of these findings is that directed conservation effort is less needed for large mammals (antelope and carnivores) that are either locally extinct or already conserved in protected areas. Of more concern are small neglected groups, such as bats, insectivores and primates.

Few mammal species surviving in the immediate region of the development are now considered of conservation concern. The African wildcat, aardvark, and honey badger were all previously considered Vulnerable (Smithers 1986). However, the African wildcat and aardvark are now considered non-threatened (Least Concern, Friedmann & Daly 2004), whilst the honey badger has been downgraded to Near Threatened (Friedmann & Daly 2004). A number of mammals are considered Data Deficient and may thus be of conservation concern. They include two shrews, the Hottentot golden mole and the woodland mouse (Friedmann & Daly 2004).

Alien and extralimital species: The only alien mammals in the region include feral domestic cats, dogs, cows and donkeys, and introduced urban rodent pests such as the house mouse (*Mus musculus*), house rat (*Rattus rattus*). The African wildcat (*Felis silvestris*) is a local endangered species, threatened by hybridization with the introduced and closely related domestic cat.

Habitat associations: Most remaining herbivores (grysbok, steenbok and bushbuck) are nocturnal browsers sheltering during the day in thicket clumps and feeding at night or dusk in the grassland-fynbos-thicket mosaic. The striped mouse is an important pollinator of some proteas (Cowling and Richardson 1995).

The distribution/occurrence of the reptiles, mammals and amphibians rests largely on the presence of habitat within the study area. There are four distinct habitat types which have or can have the potential for reptiles, mammals and amphibians:

A. Intact Renosterveld-Fynbos occurring on a rocky substrate;
B. Degraded overgrazed veld with scattered Renosterveld;
C. Cultivated pastures; and
D. Wetlands, streams and drainage lines

A. Intact Renosterveld-Fynbos occurring on a rocky substrate

This habitat type comprises fynbos growing amongst small to medium sized rocks. There is a lack of grass in this habitat. This habitat offers many different habitats and micro habitats for various animal species.

Reptiles (Figure 5-24 to Figure 5-27)

The indigenous vegetation together with the gentle slope of the land provides habitat for snakes such as the puff adder (*Bitis arientans*) and the crossed-marked sand snake (*Psammophis crucifer).* The thicker vegetation provides habitat for snakes such as boomslang (*Dispholidus typus*).The numerous lizards provide a large food source for snakes which specialise in feeding on lizards such as rhombic skaapstekers (*Psammophylax rhombeatus*) and grass snakes such as crossed marked sand snake. The Yellow-bellied house snake (*Lamprophis fuscus*), which is near threatened, may occur within this area. Geckos are limited to the Spotted thick-toed gecko

(*Pachydactylus maculatus*) which is confined to rocky areas and micro habitats under rotting logs etc. One gecko, possibly introduced into the area is the Cape dwarf gecko (*Lygodactylus capensis*). This gecko formerly occurred in Northern Natal but has spread as far as Mossel Bay. If it occurs in the area it will be found on tree trunks, farm fence post and grounded logs. This gecko is diurnal and is preyed upon by snakes such as, sand snakes, skaapstekers and boomslang. Tasman's girdled lizard (*Cordylus tasmani*), which is noted as Vulnerable, may occur within the area, on aloes. FitzSimon's long-tailed seps (*Tetradactylus fitzsimonsi*) is listed as vulnerable. This species occurs under rotting logs or rocks. The Cape grass lizard (*Chamaesaura anguina anguina*), a near threatened species, occurs in grassy areas, which is also occupied by the Red Sided Skink (*Tetradactylus homalocephala*) and Cape Skink(*Tetradactylus capensis*). All the lizards are diurnal. Due to the lack of large rocky outcrops within the proposed development site, reptiles such as Southern Rock Agamas (*Agama atra*) and Cape Girdled Lizards (*Cordylus cordylus*) may be absent. However, these two species occur on rocky areas in the coastal zone east of the site (Port Elizabeth) and they may occur south of the development site. Although not recorded, the Elandsberg Dwarf Chameleon (*Bradypodion taeniabronchum)* which is listed as endangered, has been found in the Ladies Slipper Mountain area. It is possible that this species may also occur within the proposed development site.

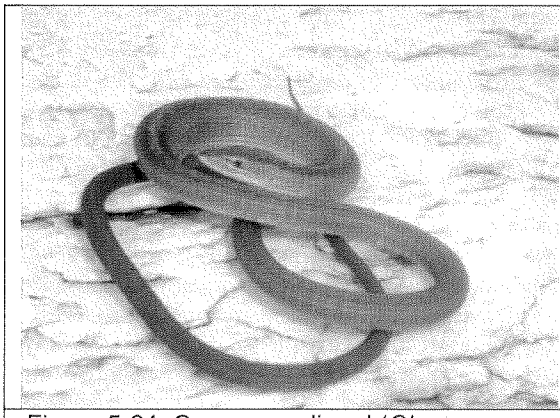


Figure 5-24: Cape grass lizard (*Chamaesaura anguina anguina*) Near threatened.

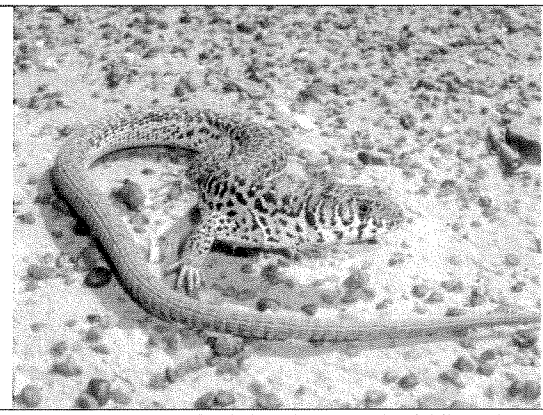


Figure 5-25: Delalandes sandveld lizard (*Nucras lalandii*)

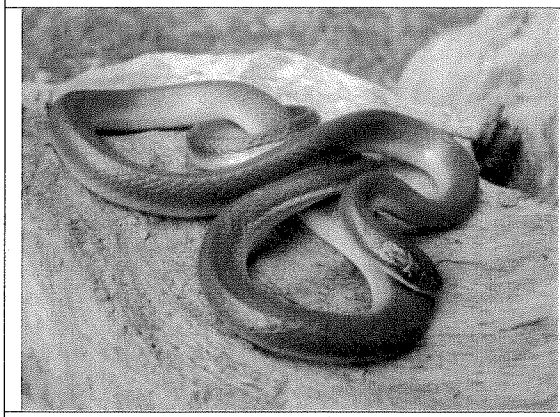


Figure 5-26: Yellow bellied house snake(*Lamprophis fuscus*); Near threatened

Figure 5-27: Elandsberg Dwarf Chameleon (critically endangered)

Amphibians

The amphibians in the proposed development site are only dependent on water for breeding. The lack of permanent water does not exclude frogs and toads from this habitat. Amphibians present include, Leopard Toad (*Amietophrynus pardalis*) and Raucous Toad (*Amietophrynus rangeri*). During rainfall they will spread into seeps, pans etc. Frogs, such as Common Cacos (*Cacosternum boettgeri*) will gather under stones and fallen logs during dry spells and emerge during rainy periods. The two toads namely the raucous and leopard toads will be found underground during dry spells and emerge during rainy periods, usually after dark. Platannas (*Xenopus laevis*) occur in the area. All the amphibians within the proposed development site are listed as Least Concern in terms of their conservation status.

Mammals

The vegetation provides habitat for mammals such the Four-striped mouse (*Rhabdomys pumilio*), and Scrub hare (*Lepus saxatilis*). The fynbos Golden mole (*Amblysomus corriae*), is listed as near threatened, is limited to the grassy areas with soft sandy soils. Small predators such as the Small-spotted genet (*Genetta genetta*) are not habitat specific and their occurrence is subject to the availability of prey items, including rodents. The Blue duiker (*Philantomba monticola*), listed as vulnerable may also occur within the area. It is restricted to the wooded areas adjacent to the site. These mammals may traverse through the proposed development site. Medium-sized mammals such as grysbok (*Raphicerus melanotis*), Common duiker (*Sylvicapra grimmia*) and porcupine (*Hystrix africaeaustralis*) may occupy the site as well. Medium-sized predators, such as the (*Felis caracal*) are known to occur in this habitat. Their movements are limited to heavily vegetated area during the day from where they emerge at night to hunt in exposed areas such as the grassed areas within the site. Few caracal are present, as they are perceived to be in conflict with livestock farming and are shot and trapped indiscriminately. Large mammals such as Bushbuck (*Tragelaphus scriptus*) are known to occur within the area. The distribution of leopards (*Panthera pardus*) covers the proposed development site, but it is highly unlikely that leopard are still present in the area as they are perceived to be a major threat to livestock farming and have probably all been eradicated from the area. Although not habitat specific, the Honey Badger (*Mellivora capensis*), with Near Threatened conservation status, may occur within the area.

B. Degraded overgrazed veld with scattered Renosterveld (and rockpiles)

This habitat consists mainly of overgrazed grasses together with scattered renosterveld

Reptiles (Figure 5-28 to Figure 5-31)

Although degraded veld, the remaining vegetation supports reptiles such as puff adders(*Bitis arietans*). The grasses provide habitat for snakes such as Rhombic Skaapstekers (*Psammophylax rhombeatus*) and grass snakes such as Crossed-Marked Sand Snake(*Psammophis crucifer*). This habitat has scattered small rocks together with manmade rockpiles; these rock piles offer shelter etc for reptiles and act as sanctuaries and hibernation get-aways for many reptiles. The Yellow Bellied House Snake (*Lamprophis fuscus*) which is near threatened occurs he presence of rocks and the man made rock piles offer habitat for the Spotted Thick Toed Gecko (*Pachydactylus maculatus*) and Tasman's Girdled Lizard (*Cordylus tasmani*), which is noted as having a Vulnerable conservation status. FitzSimon's Long-Tailed Seps (*Tetradactylus fitzsimonsi*) is listed as vulnerable and occurs within this area. The Cape Grass Lizard (*Chamaesaura anguina anguina*), a near threatened species, will occur in the grassy areas between the rocky outcrops. This habitat is also occupied by lizards such as the Red Sided Skink (*Tetradactylus homalocephala*) and Cape Skink (*Tetradactylus capensis*). All the lizards are diurnal such as the Southern Rock Agama (*Agama atra*) and Cape Girdled Lizard

(*Cordylus cordylus*). These species use the rocks as territory display points and for basking and shelter.

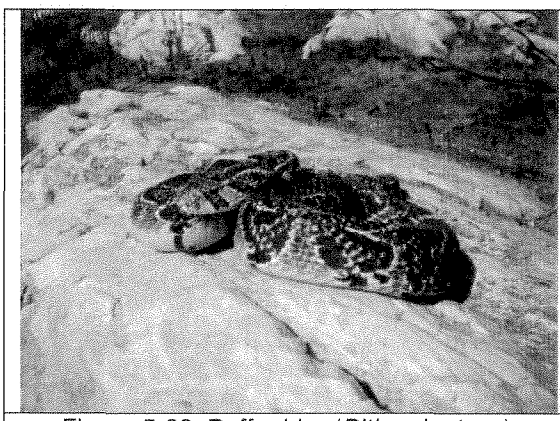


Figure 5-28: Puff adder (*Bitis arientans*) common species

Figure 5-29: Red sided skink (*Tetradactylus homalocephala*)

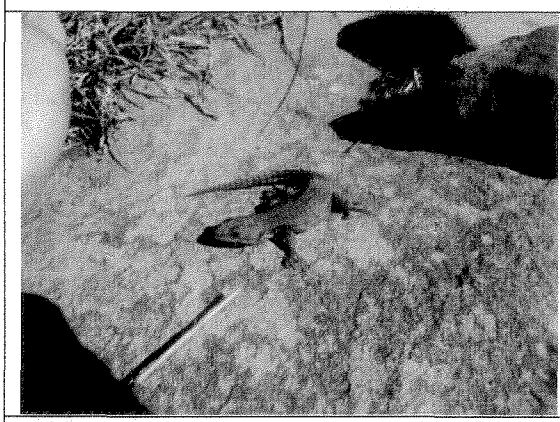


Figure 5-30: Cape girdled lizard (*Cordylus cordylus*)

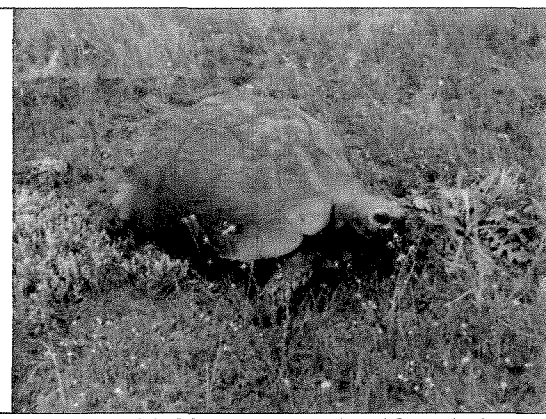


Figure 5-31: Mountain tortoise (*Geochelone pardalis*)

Amphibians

The amphibians in the proposed development site include, Leopard Toad (*Amietophrynus pardalis*) and Raucous Toad (*Amietophrynus regius*). As is the case with most frog species they are water dependent and if present, will be limited to times of heavy rainfall. They enter into now wet seeps, pans etc. Frogs, such as Common Cacos (*Cacosternum boettgeri*) will gather under stones and fallen logs during dry spells and emerge during rainy periods. The two toads, namely the raucous and leopard toads burrow underground during dry spells and also emerge during rainy periods, usually after dark. All the amphibians within the proposed development site are listed as Least Concern in terms of their conservation status.

Mammals

The vegetation provides habitats such as grassy areas, wooded areas and rocky outcrops. mammals such the Four Striped Mouse, Vlei Rat, and Scrub Hare .The Fynbos Golden Mole (*Amblysomus corriae*), is listed as Near Threatened, will be limited to the grassy soft-soil areas. Small predators such as Small Spotted Genet are not habitat specific and their occurrence is subject to the availability of prey items, such as rodents. The Blue Duiker (*Philantomba monticola*), is listed as vulnerable in terms of its conservation status will occur within the area, it

is highly unlikely that it occurs within the study area. Medium mammals such as grysbok, common duiker and porcupine occupy habitats ranging from grassland/fynbos to shrubby areas; all which occur within the proposed development sites. Few caracal are present, as they are perceived to be in conflict with livestock farming and are shot and trapped indiscriminately. Although not habitat specific, the Honey Badger (*Mellivora capensis*), with Near Threatened conservation status, will occur within the area.

C. Cultivated pastures (transformed areas)

Most of the site consists of transformed cultivated agricultural land, which is presently used for cattle grazing.

Reptiles
Common reptiles are Puff Adders (*Bitis arietans*). Even though the land consists mainly of grasses, it nevertheless offers a passage way for reptiles to traverse through. Open grassy areas may be occupied by snakes such as Rhombic Skaapstekers (*Psammophylax rhombeatus*) and grass snakes such as Crossed Marked Sand Snake (*Psammophis crucifer*). FitzSimon's Long-Tailed Seps (*Tetradactylus fitzsimonsi*), is listed as vulnerable and occurs within this area.

Amphibians
The amphibians in the proposed development site include Clicking Stream Frog (*Strongylopus grayii*) which may be limited to the cattle watering points, Leopard Toad *(Amietophrynus pardalis*) and Raucous Toad (*Amietophrynus regius*). During times of rainfall, they will spread in distribution and enter into now watered seeps, pans etc. Frogs, for example, Common Cacos (*Cacosternum boettgeri*) will gather under accessible stones and grounded logs during dry spells and emerge during rainfall periods. The two occurring toads, namely: raucous toad and leopard toads will be fund underground during dry spells and will also emerge during times of rain fall, this is usually after dark. All the amphibians within the proposed development site are listed as least concern in terms of their conservation status.

Mammals
The vegetation provides habitats for mammals such as the four-striped mouse, vlei rat, and scrub hare. The Fynbos Golden Mole (*Amblysomus corriae*), is listed as Near Threatened, will be limited to the grassy soft-soil areas. Small predators such as small spotted genet are not habitat specific and their occurrence is subject to the availability of prey items, such as rodents. The Blue Duiker (*Philantomba monticola*), is listed as vulnerable in terms of its conservation status occur within the area, but only in terms of it using the pasture lands to cross to other more suitable habitats, the same will be in terms of larger mammals such as grysbok and common duiker. Medium predators, for example Caracal occur in this habitat. Few caracal are present, as they are perceived to be in conflict with livestock farming and are shot and trapped indiscriminately. The distribution of leopards covers the proposed development site. It is highly unlikely that leopard are still present in the area as they are a large threat to livestock farming and are probably all eradicated from the area. Although not habitat specific, the honey badger (*Mellivora capensis*), with near threatened conservation status, will occur within the area. Bush pig may be attracted to this area in search of grass roots etc for feeding purposes.

D. Wetland, Seeps and Drainage Lines

Reptiles (Figure 5-32 & Figure 5-33)
Certain reptiles are attracted to water bodies in search of food, such as frogs and toads. These reptiles are snakes such as Rinkhals (*Hemachatus haemachatus*) and red lipped herald snakes (*Crotaphopeltis hotamboeia*). Even though the pan seldom contains permanent water, it still provides habitat for reptiles. Open grassy areas surrounding the wetland may be occupied by

snakes such as rhombic skaapstekers (*Psammophylax rhombeatus*) and grass snakes such as the crossed-marked sand snake (*Psammophis crucifer*) and puff adders (*Bitis arietans*) FitzSimon's long-tailed seps (*Tetradactylus fitzsimonsi*), is listed as Vulnerable and occurs within this area. The mud/marsh terrapin (*Pelomedusa subrufa)* will be limited to this pan.

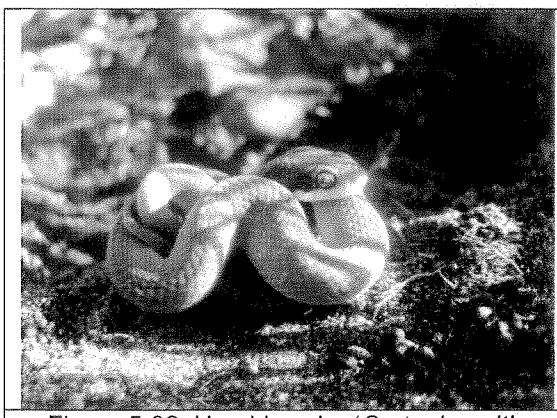


Figure 5-32: Herald snake (*Crotaphopeltis hotamboeia)*

Figure 5-33: Rinkhals *(Hemachatus haemachatus)*

Amphibians (Figure 5-34 & Figure 5-35)
The amphibians on the proposed development site include clicking stream frog (*Strongylopus grayii*),Painted reed frog (*Hyperolius marmoratus*) leopard toad *(Amietophrynus pardalis*) and raucous toad (*Amietophrynus regius*). They will emerge during heavy rainfall when they enter into now into wet seeps, pans etc.. The two occurring toads, namely: raucous toad and leopard toads will be fund underground during dry spells and will also emerge during times of rain fall, this is usually after dark. In times of rainfall, this pan provides the main breeding ground for many of the amphibians throughout the entire proposed development site. It is a vital asset to the habitat of amphibians and therefore to the reptiles which depend on them for food. All the amphibians within the proposed development site are listed as least concern in terms of their conservation status.

Figure 5-34: Painted reed frog(*Hyperolius marmoratus*)

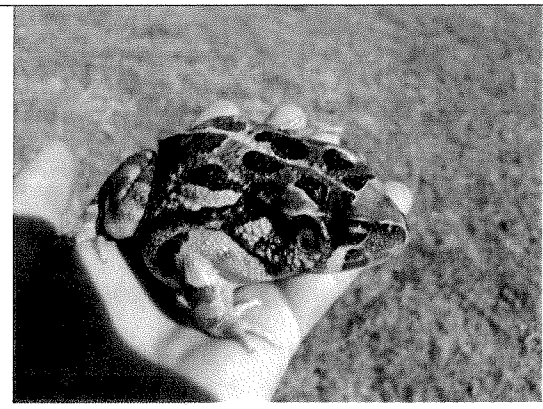


Figure 5-35: Eastern leopard toad (*Amietophrynus pardalis*)

Mammals

The vegetation provides habitats for mammals such the four striped mouse, vlei rat, and scrub hare. The fynbos golden mole (*Amblysomus corriae*), is listed as near threatened, will be limited to the grassy soft soiled areas. Small predators such as small spotted genet are not habitat specific and their occurrence is subject to the availability of prey items, such as rodents. The blue duiker (*Philantomba monticola*), is listed as vulnerable in terms of its conservation status occur within the area, but only in terms of it using the pasture lands to cross to other more suitable habitats, the same will be in terms of larger mammals such as grysbok and common duiker. Medium predators, for example occur in this habitat. Few caracal are present, as they are perceived to be in conflict with livestock farming and are shot and trapped indiscriminately. The distribution of leopards covers the proposed development site. It is highly unlikely that leopard are still present in the area as they are a large threat to livestock farming and are probably all eradicated from the area. Although not habitat specific, the honey badger (*Mellivora capensis*), with near threatened conservation status, will occur within the area. Bush forage in this pan; as seen from evidence left from them during the site visit. They are attracted to this area in search of grass roots, tubers, bulbs, etc for feeding purposes.

5.4 IDENTIFICATION OF ISSUES AND IMPACTS

5.4.1 Vegetation and Flora

The proposed development is likely to have a number of impacts on the plants and plant communities within the site. During the drafting of the proposed site development plan, a number of processes were followed to reduce potential impacts during initial design stages. A draft sensitivity and buffer map was compiled during an initial site visit and project specialist workshop to indicate most sensitive areas that preferably should be avoided. Furthermore comments were made throughout the process regarding specific issues as they arose during the initial during layout design. The proposed site development plans have thus sought to avoid the most sensitive areas as far as possible. In this manner many potential impacts have been mitigated in the design phase rather than implementation of mitigation measures during construction and operation. The main impacts are: (a) loss of habitat; (b) reduction or changes to ecological processes/functioning; and (c) loss of species of special concern or SSC habitat.

A. Loss of habitat

Since the majority of the turbine sites and access roads have been positioned in old pastures and previously cultivated areas loss of habitat is unlikely to be significant in extent. Loss of Loerie Conglomerate Fynbos and Humansdorp Shale Renosterveld will be restricted to a few peripheral locations within the site. Loss of habitat will only occur during construction but will persist for the duration of the project. During the project design phase wetland and riparian habitat and Gamtoos Thicket areas were identified as being highly sensitive and have been avoided as far as possible with only a few strategic road crossing of seep/drainage line areas being necessary. Existing farm roads have been used where possible and it is likely that there will be an improvement as a result of better constructed road crossings in riparian areas after construction. All identified wetlands were avoided during the initial design phase.

B. Reduction or changes to ecological processes and functioning

Since the majority of the site is already disturbed (cultivation) impacts to ecological processes are likely to be significantly lower than were the site in a natural or pristine state. Some peripheral disruptions may occur where turbines are sited in intact Loerie Conglomerate Fynbos and Humansdorp Shale Renosterveld. Temporary fragmentation of habitats is likely to occur during construction of roads, most notably where riparian crossings may be necessary. Habitat fragmentation will persist for the duration of the development. However, this fragmentation will be

limited in significance and extent and is unlikely to persist after construction is completed provided rehabilitation is undertaken successfully. Some habitat fragmentation may persist during the operational phase. A potential risk of increased alien (and other exotic weed) invasion will persist during construction and operational phases as a result of the introduction and dispersal of plant propagules (seeds) from outside the site via increased traffic. This could be especially prevalent along disturbed road reserves where weedy and invasive species tend to proliferate. Fire regime changes may also be possible as a result of increased vehicular and other traffic into the area during and post construction. Accidental fire risk is likely to increase, which could result from discarded cigarette butts or other means. The opposite is also likely: because veld fires pose a hazard to the wind generators the veld (fynbos) may senesce and/or build up a very large (dangerous) fuel load. Veld/fire management will be critical both for the safety of the wind farm and for the health of the vegetation.

C. Loss of species of special concern and SSC habitat
A number of Species of Special Concern occur within the Loerie Conglomerate Fynbos and Humansdorp Shale Renosterveld which is likely to result in the potential loss of some SSC. It is unlikely that any SSC are present in the riparian areas, especially considering that layout design will target already disturbed areas for crossings. It is, furthermore, unlikely that any protected Gamtoos Thicket flora will be disturbed, although it is recommended that during micro-siting of turbines and roads, any thicket micro-clumps be avoided. Loss of SSC habitat will occur during construction and will persist for the duration of the project.

The following key impacts have thus been identified:
A. Loss of habitat
1. Loss of Loerie Conglomerate Fynbos Habitat
2. Loss of Humansdorp Shale Renosterveld Habitat
3. Loss of Gamtoos Thicket (including Thicket clumps) Habitat
4. Loss of Riparian and Wetland vegetation Habitat

B. Reduction or changes to ecological processes and functioning
5. Alteration of Loerie Conglomerate Fynbos ecological processes and functioning
6. Alteration of Humansdorp Shale Renosterveld ecological processes and functioning
7. Alteration of Gamtoos Thicket (including Thicket clumps) ecological processes and functioning
8. Alteration of Riparian and Wetland vegetation ecological processes and functioning
9. Temporary fragmentation of habitats during construction
10. Increased risk of alien plant invasion in drainage lines and disturbed areas
11. Changes in the natural fire regime
12. Overall reduction in ecosystem functioning

C. Loss of species of special concern and SSC habitat
13. Loss of Loerie Conglomerate Fynbos SSC and SSC habitat
14. Loss of Humansdorp Shale Renosterveld SSC and SSC habitat
15. Loss of Gamtoos Thicket SSC and SSC habitat
16. Loss of Floral SSC and SSC habitat

5.4.2 Fauna

Within the scope of this report, five main impacts on the fauna have been identified with respect to the erection of wind turbines, and the construct and operational phases.
The identified impacts are as follows:
1. Habitat destruction may affect faunal diversity and composition;
2. Road mortality from trucks and other service vehicles;

3. Poaching(mammals);
4. Fauna harmed by fences (mammals/reptiles); and
5. Corridor disruptions as a result of habitat fragmentation.

1. Habitat destruction may affect faunal diversity and composition
The construction of roads, widening of existing roads, building of bridges; and site clearing will destroy existing habitats.

Description of the Impact: This impact involves the direct removal and destruction of habitats, for example: When constructing a road which is five meters wide the actual destruction tends to be greater than 5 meters in width, to allow for construction vehicles etc. to travel next to the road under construction. The same principle applies to the widening of an existing road. With reference to the erection of wind turbines, the disturbance footprint in the construction phase may be greater than 20 x 20 meters. This may seem minimal but consideration must be taken into account of the turning areas needed for the large delivery trucks and machinery used in construction. As a case study, the wind turbine erected at the Coega site clearly shows that a larger footprint has been cleared during construction. The edges of the development footprint do however often create new habitats for reptiles.

Figure 5-36: Example of typical wind turbine footprint lay down area (Coega IDZ).

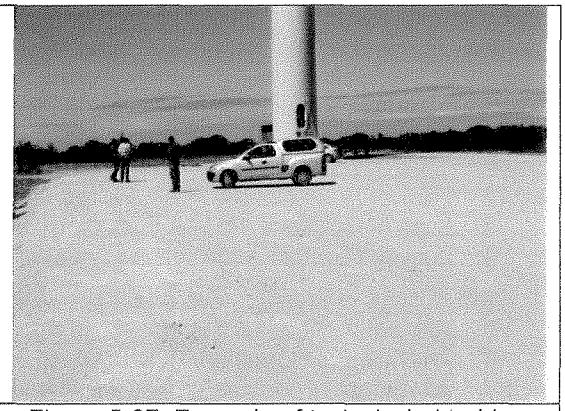


Figure 5-37: Example of typical wind turbine footprint (including lay down area and turbine footprint).

2. Road mortality from trucks and other service vehicles
Frequent truck/vehicle road activity will result in mortality of reptiles.

Description of the Impact: Reptiles frequent roads for various reasons including searching for food, basking during the day, "moon basking" which occurs when reptiles lie on roads at night to absorb warmth from the road surface, or merely to cross to the other side. Amphibians frequent roads mainly to cross between wetlands or from aestivation places to wetlands during migrations. The main factor influencing amphibian movement is rain and during rainy periods amphibians are at their most mobile. For example Leopard toads will migrate simultaneously from aestivation grounds to the nearest breeding grounds (i.e. seasonal wetlands) and inevitably have to cross roads. As many as 298 leopard toads were killed within an hour along a 50 meter stretch of road near Lake Farm in Port Elizabeth during one such event. Many carnivorous mammals are attracted to roads to search for food. Mammals also frequently cross roads. These factors all contribute to the fauna being subjected to road mortality.

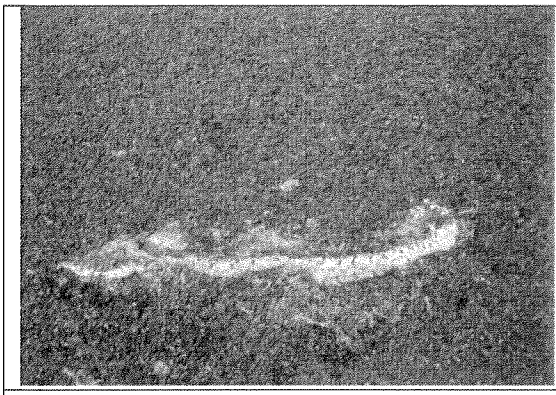


Figure 5-38: Example of Puff adder (*Bitis arietans*), killed on road

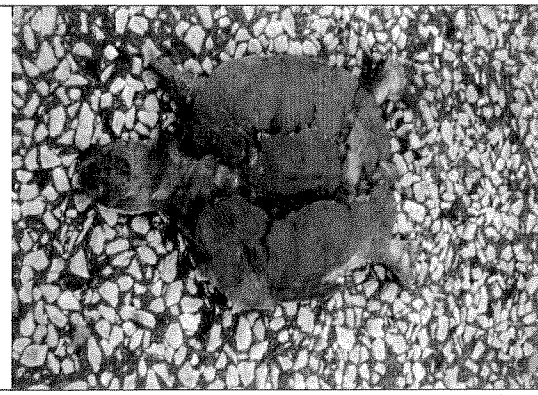


Figure 5-39: Example of Marsh terrapin killed by vehicle on road.

3. Poaching (Mammals)

The construction/operational activities will take place near fence lines. Workers may set snares to trap animals for food etc.

Description of the Impact: Many customary traditions involve the hunting of animals with particular interest in mammals such as grysbok. The demand for so called 'bush-meat' is often high within rural communities. Wild animals are used for meat, fur coats, medicinal uses etc. The main method utilised for poaching animals is the noose/wire snare which is usually placed on a fence line, where animals are noted to cross. The animal pushes its head through the circular snare, and as it passes through the snare, the snare tightens and eventually suffocates the animals. The wire snare often catches on the animals limbs, which can also result in the animals becoming disabled.

4. Fauna harmed by fences (mammals/reptiles)

Fauna such as grysbok may enter the fenced off areas around the wind turbine (and sub-station) footprints and get trapped (Figure 5-40 & Figure 5-41).

Description of the Impact: The wind turbine sites may be fenced off during the operational phase or certain "no go" areas may be fenced off during construction. In this situation certain animal species may be harmed. For example animals such as the blue duiker and grysbok will run against a fence until they find an escape route. In this process they can injure themselves severely. Access gates which are left open may act as a trap. The animal wanders into the fenced area and does not know the way out. The type of fence in this situation will greatly affect the impact. Electrified fences can also be dangerous to mammals, tortoises and larger reptiles such as water monitor lizards. They may be harmed or killed by electrocution when trying to pass through such fences.

Figure 5-40: Example of water monitor electrocuted in fence

Figure 5-41: Example of fence-line near a proposed development site

5. Corridor disruptions as a result of habitat fragmentation
The ecological corridor may be disturbed when permanent structures are placed within a functioning corridor.

Description of the Impact: In terms of ecological corridors, the fauna within the proposed development site as a whole are familiar with their surroundings. For example tortoises know their home ranges etc. With the construction of a feature such as a raised road through their habitat, they can become displaced or disorientated. Throughout the entire development site as a whole there are numerous movement corridors which may be altered, manipulated or destroyed. The main factor regarding corridors for animal is access. Allowance has to be made for animals to gain access through each corridor and between corridors and the road design should allow for this wherever possible.

5.4.3 Site layout Alternatives

5.4.3.1 Alternative A: 50 X 2MW Turbines (V90)

Proposed alternative Layout A will comprise 50 x 2 MW wind turbines with associated access roads and cabling. Existing roads will be utilised as far as possible which will serve to reduce overall impacts to some extent. Layout A in relation to the mapped vegetation of communities is shown in Figure 5.42.

The resulting loss of habitat will be proportional to the area vegetation clearing required to construct the access roads, cabling and the 50 turbine sites with associated hard-standing surfaces.

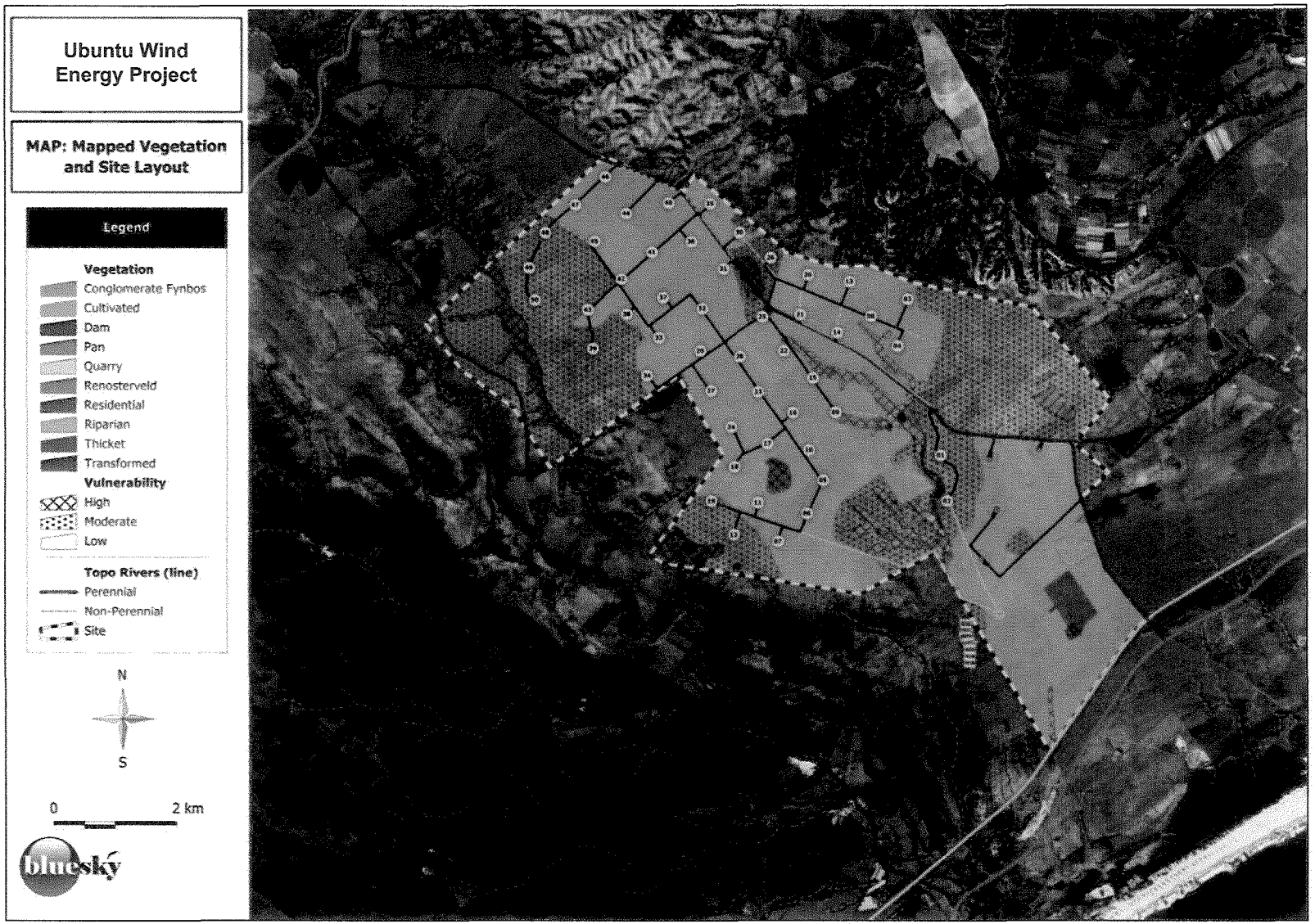


Figure 5.42: Mapped Vegetation communities with alternative A layout overlain (V90).

5.4.3.2 Alternative B: 40 X 2.5MW Turbines (V100)

Proposed alternative Layout B will comprise 40 x 2.5 MW wind turbines with associated access roads and cabling (see Figure 5.43). Existing roads have been utilised as far as possible, which will serve to reduce overall impacts to some extent.

The resulting loss of habitat will be proportional to the area vegetation clearing required to construct the access roads, cabling and 33 turbine sites with associated hard-standing surfaces. Overall this is likely to result in a significantly lower impact (due to the lower number of hard-standing surfaces) to the overall site than alternative A (and slightly lower than alternative B), although access roads will still be required.