WKN Windcurrent

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

DEA Ref Number: 12/12/20/1752

CSIR Report Number: GWDMS STEL GEN 9716

Prepared by:
CSIR
Contact person:
Ms. Minnelise Levendal
PO Box 320, Stellenbosch, 7599

Tel: 021 – 888 2495/2661
Fax: 021 – 888 2693
Email: mlevendal@csir.co.za

Prepared for:
WKN-Windcurrent SA (Pty) Ltd
Contact person:
Mr Alan Wolfromm
PO Box 762
Wilderness
6560
Tel: 044 877 0564

Public Process Consultants
Environmental Impact Assessment and Public Participation Management

CSIR our future through science

October 2011

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

Report Details

Title:	**Environmental Impact Assessment for the proposed WKN-Windcurrent Ubuntu Wind Energy Project near Jeffrey's Bay: Final Environmental Impact Assessment Report**
Purpose of this report:	This Final 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 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 were made available to all stakeholders for a 40-day review period from 18 August 2011 until 26 September 2011.. All comments on the Draft EIA and EMP were considered in preparation of the Final EIA and EMP. The Final EIA Report and EMP are hereby 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

SUMMARY

Lead authors:	Minnelise Levendal, Paul Lochner and Sandy Wren (Public Process Consultants)
CSIR Report No.	GWDMS STEL GEN 9716
CSIR Project No.	CASKG87
DEA Ref Number	12/12/20/1752
Date	October 2011
To be cited as:	CSIR (2011): *Environmental Impact Assessment for the proposed Ubuntu Wind Energy Project for WKN-Windcurrent SA (Pty) Ltd: Final Environmental Impact Assessment Report*. CSIR Report No. GWDMS STEL GEN 9716.

SUMMARY

Contents

Summary

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 3.2 MW. The total number of turbines could therefore vary from 31 turbines of 3.2 MW to 50 turbines if a 2 MW turbine is used. The size of the turbine will be finalised pending the availability of turbines from the local manufacturing market.

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.

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

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.

PROJECT DESCRIPTION

Wind turbines and wind monitoring masts

Thirty one 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 3.2 MW). The turbines will have an expected hub height from 80 m to 105 m and a blade diameter from 90 m to 117 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. The final internal underground cabling design will not traverse any sensitive areas as identified by the environmental specialists. The impact through trenches for the underground cabling can thus be minimised by decreasing the total lengths needed.

A new sub-station (maximum size of 100 m by 100m) 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 temporary lay down area for laying down parts and containers – an area of approximately 125m by 150m. The specialists have reviewed this area and have confirmed that it is not sensitive from an environmental perspective.

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 was released to stakeholders for a 40-day comment period from 18 August 2011 until 26 September 2011. All comments received were included in the Final EIA Report, which is hereby submitted to DEA for review and decision-making. This Final EIA Report will be

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 will be notified of the release of the Final 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 Final 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 Final EIA 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).

Subsequent to the selection of the three turbine types above, WKN-Windcurrent identified the REpower 3.2 MW turbine as potentially suitable for this project, one of the reasons being that it allows for a larger local manufacturing component. The 3.2 MW REpower turbine has been included in the Final EIA Report as an alternative turbine type that may be used. The range of turbine sizes in the Final EIA report is therefore from 2.0 to 3.2 MW. The total number of turbines could therefore vary from 31 turbines of 3.2 MW, to 50 turbines if a 2 MW turbine is used. The specifications (e.g. physical scale and noise emissions) for the 3.2 MW REpower turbine are directly comparable to the Vestas V122 3.0 MW turbine that was assessed as one of the typical turbines in the specialist studies. The final turbine selection will depend on the availability of turbines, commercial factors and local manufacturing opportunities.

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 which commenced in January 2011. Since the pre-construction monitoring commenced on the site, a number of important developments have taken place. The most important development from an avifaunal

impact perspective was the publication of "*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). Version 1 of this document was placed in the public domain on 31 March 2011, and was slightly amended in August 2011. The monitoring protocol used in this study was designed and commenced with before the existence of any South African best practice guidelines, and originally (Nov 2010) with the available knowledge at the time and after consulting other avifaunal specialists, two sampling periods (summer and winter) were planned. After the guidelines were released, an additional sampling period (spring) was added. The monitoring was completed in September 2011. The following conclusions can be drawn from the pre-construction monitoring, subject to further post-construction monitoring:

- Of the priority species, Blue Cranes may be most at risk of collisions with turbines, but less at risk as far as displacement is concerned, due to the species general high tolerance levels of human activity;
- Denham's Bustard may also be at risk, but the risk could be reduced due to the potential of displacement when the farm is operational;
- Flight patterns of priority species at medium height recorded to date do not indicate any distinct flight corridors which could be mitigated by the relocation of any of the proposed turbine locations. The flights seem to be randomly distributed across the turbine area. Actual collision "hot-spots" (none of which have currently been identified) will only become apparent through post-construction monitoring i.e. systematic carcass searches;
- The overall collision risk to priority species as a group, based on the data that was recorded over the three sampling periods, is predicted to be low;
- The survey area is particularly well suited for Denham's Bustard and White-bellied Korhaan, but the study area is not unique in this respect, this statement is applicable to the entire Jeffrey's Bay, Humansdorp and Oyster Bay region.
- Of the bird habitat identified on the site, grassland is the most important habitat for priority species;
- At this stage, one can only speculate about the likelihood of potential displacement of 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; and
- The potential for habituation always exists, but due to the scarcity of published research on this topic, no unequivocal predictions can be made. As far as raptors are concerned, the chances of displacement are low, based on research results elsewhere. This trend also seems to be supported by the results of the limited post-construction monitoring conducted at the existing 4 turbines at the Darling Wind Farm. Blue Cranes might also be more tolerant, based on general observations in the study area where Blue Cranes breed and forage in close proximity to agricultural operations.

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. 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 Denham's Bustard, White-bellied Korhaan, Blue Crane and Secretarybird. 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. In the unlikely event of them re-using the nest in 2012, appropriate mitigation must be agreed upon between the avian specialist and the developer 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 off-set compensation should be negotiated with developer to compensate for the loss of priority species habitat; and
- 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.

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.

Monitoring, which is in progress, is required to determine the extent of bat fatalities, and the species affected. If data collected up to now is taken into account, the impact of the wind turbines on bats on the Ubuntu site is predicted to be 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. After the full set of pre-construction data are available, and if it is confirmed that there is little bat activity on the site, the predicted impact could then be deemed to be low.

Mitigation

- Bat pre-construction monitoring to continue and include spring and Summer, as well as more extensive Autumn monitoring;
- It is further recommended that post-construction monitoring be undertaken to determine the extent of bat fatalities, and the species affected, if any, while the turbines are in operation.
- 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 complete monitoring period, 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).

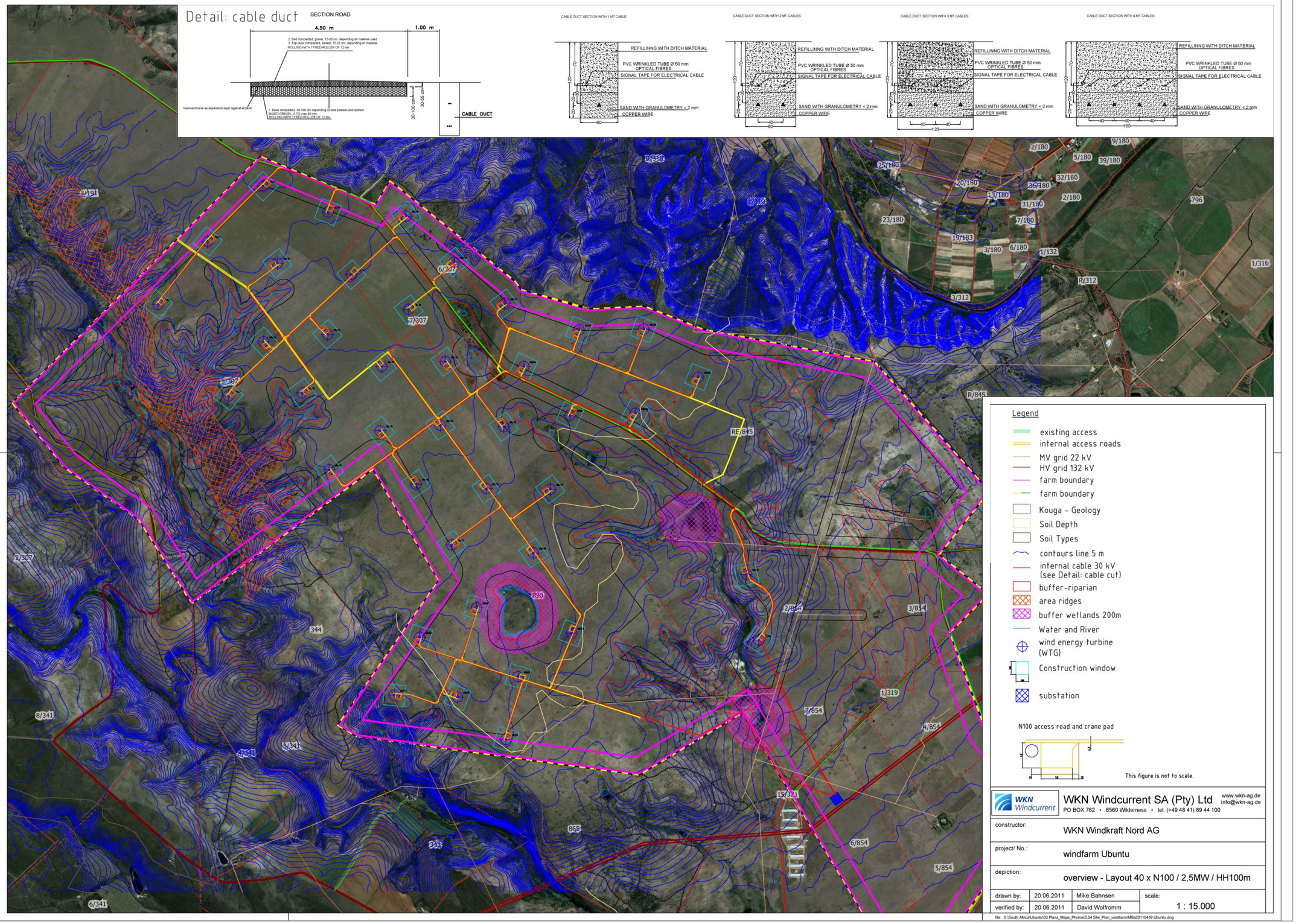
- Another impact is infrequent bat mortality due to collision with the wind turbine blades or barotrauma and the visual impact of the turbines on the sense of place. The impacts on bats are predicted to be of **low** significance after mitigation (**confidence level is medium** as this is based on preliminary 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*

***Figure S.2**:* *Proposed no-go areas identified in the specialist studies for the proposed Ubuntu project.*



COMMITMENT STATEMENT BY WKN-WINDCURRENT SA (PTY) LTD

WKN Windcurrent SA (Pty) Ltd
PO Box 762
Wilderness 6560
South Africa

29 September 2011

Commitment Statement: Final EIA Report – Ubuntu Wind Farm, DEA reference number: 12/12/20/1752

WKN-Windcurrent SA (Pty) Ltd (WKN-Windcurrent) is a South African company specialising in the development of renewable energy projects. Ubuntu Windfarm (Pty) Ltd is a South African company formed with the express purpose of owning and operating the Ubuntu Wind Farm (the project).

The CSIR has been appointed by WKN-Windcurrent SA (Pty) Ltd, acting on behalf of Ubuntu Windfarm (Pty) Ltd, to undertake the Environmental Impact Assessment for the construction of the (proposed) 100 MW wind energy facility northeast of Jeffrey's Bay in the Eastern Cape.

WKN-Windcurrent undertakes to comply with all statutory and legislative requirements of South African law, specifically with regard to environmental aspects relating to the development of the Ubuntu Wind Farm.

Throughout the EIA process, WKN-Windcurrent has worked closely with stakeholders and the CSIR. The company is fully commited to implement the recommendations of the specialists as presented by the CSIR in the Final Environmental Report.

The company supports the recommendations for pre- and post construction monitoring for both birds and bats, and undertakes to ensure completion of these studies, to be carried out by specialists in those fields.

In addition, WKN-Windcurrent recognises that the project has socio-economic benefits for the local area, and as such, commits to doing all that is possible to ensure that local business and local labour are involved in the construction and operation of the Ubuntu Wind farm.

The company, in expectation of all requirements being concluded within the necessary timeframe, undertakes to continue communications regarding the status of the project with all stakeholders, including national, regional and local authorities, as well as interested and affected parties, and the local community.

Yours sincerely

Alan Wolfromm
(Director)

WKN Windcurrent SA (Pty) Ltd
Reg 2010/022616/07
VAT nr 4850258239
PO BOX 762 Wilderness 6560 South Africa
+ 27 (0)44 877-0564 + 27 (0)86 610-2779
Email: mrwolf@mweb.co.za

...2

WHAT IS NEW IN THE FINAL EIA REPORT?

This section provides an overview of the refinements made to the Final EIA Report (October 2011) since the publishing of the Draft EIA Report. These updates have not changed the findings of the EIA or any of the assessment ratings.

1. WKN-Windcurrent has signed a letter of commitment to indicate that they will implement the mitigation measures and recommendations proposed in the specialist studies and the EMP of the Final Environmental Impact Assessment Report (EIA Report). They also commit to adhere to the conditions imposed by the national Department of Environmental Affairs, should this project receive Environmental Authorisation (see "Proponent's Commitment Statement" inserted at the front of the report).

2. The Draft EIA Report included a range of turbine sizes from 2.0 to 3.0 MW. Subsequently, WKN-Windcurrent identified the REpower 3.2 MW turbine as potentially suitable for this project, one of the reasons being that it allows for a larger local manufacturing component. The 3.2 MW REpower turbine has been included in the Final EIA Report as an alternative turbine type that may be used. The range of turbine sizes in the Final EIA report is therefore from 2.0 to 3.2 MW. The total number of turbines could therefore vary from 31 turbines of 3.2 MW, to 50 turbines if a 2 MW turbine is used. The specifications (e.g. physical scale and noise emissions) for the 3.2 MW REpower turbine are directly comparable to the Vestas V122 3.0 MW turbine that was assessed as one of the typical turbines in the specialist studies. Therefore the impact ratings have not changed from what was presented in the Draft EIA Report. The final turbine selection will depend on the availability of turbines, commercial factors and local manufacturing opportunities.

3. The maximum blade diameter has increased from 112 m to 117 m. The tip height will not increase; hence the visual impact will remain the same.

4. The size of the sub-station has been included (maximum size of 100 m by 100 m).

5. The position of the proposed laydown area has been finalised. The specialists were requested to comment on this location. They confirmed that the proposed area is not sensitive in terms of their respective specialist field and therefore does not change their impact assessment significant ratings.

6. It was confirmed that the final internal underground cabling design will not traverse any sensitive areas as identified by the environmental specialists. The impact through trenches for the underground cabling can thus be minimised by decreasing the total lengths needed.

7. The EIA Summary and the Conclusions chapter (Chapter 14) have been updated to reflect the latest changes since the release of the Draft EIA Report as discussed above.

8. The Chapter on the Approach to the EIA has been updated to indicate the Public Publication Process followed since the release of the Draft EIA Report (Chapter 4).

9. Pre-construction bird monitoring was undertaken by two experienced bird monitors under the guidance of the bird specialist, Chris van Rooyen. The monitoring was completed in September 2011. The monitoring was done over three sample periods, i.e. summer, winter and spring. Both densities and flight patterns of priority species were recorded. The results from the monitoring programme and the proposed mitigation measures based on the monitoring are included in the updated Bird specialist study (Chapter 6 of the Final EIA Report).

10. .The bat monitoring programme started in May 2011and will be continued until April 2012 so as to obtain 12 months' of bat data as prescribed by the South African guidelines.

11. Communications to Interested and Affected Parties following the release of the Draft EIA Report are included (Appendix F).

12. Details regarding the second public meeting Jeffrey's Bay on 23 September 2011 following the release of the Draft EIA Report are included. It includes the attendance register and the minutes of the public meeting (Appendix H).

13. Correspondence received from Interested and Affected Parties following the release of the Draft EIA Report are included (Appendix G).

14. A Comments and Response Trail has been added where comments received from Interested and Affected Parties after the release of the Draft EIA report are addressed (Appendix I). Comments following the release of the Final Scoping Report are also included in Appendix I.

15. The EMP has been updated (Section B of the Final EIA Report). This includes recommendations on stormwater management.

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).