PROPOSED UMSOBOMVU WIND ENERGY FACILITY, NORTHERN CAPE & EASTERN CAPE PROVINCES, SOUTH AFRICA

VISUAL IMPACT ASSESSMENT

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1 INTRODUCTION

One of the significant environmental issues identified during the scoping phase of the Umsobomvu Wind Energy Facility Environmental Assessment process was the visual impact of the proposed development on the landscape. A Visual Impact Assessment (VIA) is therefore included as part of the Environmental Impact Assessment (EIA) process.

This report provides specialist visual assessment input into the EIA process relating to the proposed Umsobomvu Wind Energy Facility project. The proposed project will include approximately 80 wind turbines, with a potential power output of 140 megawatts (MW).

Oberholzer (2005) notes that visual, scenic and cultural components of the environment can be seen as a resource, much like any other resource, which has a value to individuals, to society and to the economy of the region. In addition, this resource may have a scarcity value, be easily degraded, and is usually not replaceable.

For the purposes of conducting the visual assessment, guidance has been taken from the Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning (DEA&DP) Guideline for Involving Visual and Aesthetic Specialists in the EIA Process (Oberholzer, 2005).

The Terms of reference for the Visual Impact Assessment are as follows:
1. Conduct a site reconnaissance visit and photographic survey of the proposed project site.
2. Conduct a desk top mapping exercise to establish visual sensitivity:
   • Describe and rate the scenic character and sense of place of the area and site.
   • Establish extent of visibility by mapping the view-sheds and zones of visual influence
   • Establish visual exposure to viewpoints
   • Establish the inherent visual sensitivity of the site by mapping slope grades, landforms, vegetation, special features and land use and overlaying all relevant above map layers to assimilate a visual sensitivity map.
3. Review relevant legislation, policies, guidelines and standards.
4. Preparation of a draft Visual Baseline/Sensitivity report:
   • Assessing visual sensitivity criteria such as extent of visibility, the sites inherent sensitivity, visual sensitivity of the receptor’s, visual absorption capacity of the area and visual intrusion on the character of the area
   • Assess the proposed project against the visual impact criteria (visibility, visual exposure, sensitivity of site and receptor, visual absorption capacity and visual intrusion) for the site.
   • Assess impacts based on a synthesis of criteria for each site (criteria = nature of impact, extent, duration, intensity, probability and significance)
   • Establish mitigation measures/recommendations with regards to minimizing visual risk areas.

The visual impact assessment follows the guidelines set out by Oberholzer (2005): Guidelines for Involving Visual Specialists in EIA processes. These guidelines were issued by the Provincial Government of the Western Cape: DEA&DP.

For the purpose of the visual assessment, a site visit was undertaken from the 23rd until 26th September 2014.
2 TRIGGERS FOR SPECIALIST VISUAL INPUT

The DEA&DP guideline suggests various triggers for conducting a Visual Impact Assessment (VIA). With respect to the proposed Umsobomvu WEF, a number of aspects of the development may trigger the need for a VIA. These include:

- Areas lying outside a defined urban edge line;
- Areas with important vistas or scenic corridors;
- Areas with visually prominent ridgelines or skylines; and
- Possible visual intrusion in the landscape.

The purpose of conducting a visual and aesthetic assessment is to determine:

- The visibility of the proposed project;
- The potential visual impact on visual/scenic resources;
- The nature, extent, duration, magnitude, probability and significance of impacts, as well as measures to mitigate negative impacts and enhance benefits; and
- The character and visual absorption capacity of the landscape.

2.1 Selecting appropriate approach for the visual and aesthetic assessment

The category of development influences the level of visual impact to be expected. As is illustrated in Table 1, a wind energy facility is considered a category five development.

Table 1: Key to categories of Development

<table>
<thead>
<tr>
<th>Category</th>
<th>Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category 1 development:</td>
<td>e.g. nature reserves, nature-related recreation, camping, picnicking, trails and minimal visitor facilities.</td>
</tr>
<tr>
<td>Category 2 development:</td>
<td>e.g. low-key recreation / resort / residential type development, small-scale agriculture / nurseries, narrow roads and small-scale infrastructure.</td>
</tr>
<tr>
<td>Category 3 development:</td>
<td>e.g. low density resort / residential type development, golf or polo estates, low to medium-scale infrastructure.</td>
</tr>
<tr>
<td>Category 4 development:</td>
<td>e.g. medium density residential development, sports facilities, small-scale commercial facilities / office parks, one-stop petrol stations, light industry, medium-scale infrastructure.</td>
</tr>
<tr>
<td>Category 5 development:</td>
<td>e.g. high density township / residential development, retail and office complexes, industrial facilities, refineries, treatment plants, power stations, wind energy farms, power lines, freeways, toll roads, large-scale infrastructure generally. Large-scale development of agricultural land and commercial tree plantations. Quarrying and mining activities with related processing plants.</td>
</tr>
</tbody>
</table>

Table 2 indicates that visual assessments become more critical where wilderness or protected landscapes are involved, as well as when high density urban development or large scale infrastructure are being considered. In the context of the Eastern Cape Province and Northern Cape Province, the Umsobomvu WEF area is considered in this report to be of medium scenic, cultural or historical significance. Based on the table, it is deemed that a "High Visual Impact is expected" for the proposed Umsobomvu WEF.
**Table 2: Categorization of issues to be addressed by the visual assessment (DEA&DP Guidelines)**

<table>
<thead>
<tr>
<th>Type of environment</th>
<th>Category 1 development</th>
<th>Category 2 development</th>
<th>Category 3 development</th>
<th>Category 4 development</th>
<th>Category 5 development</th>
<th>Category 6 development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protected/wild areas of international, national, or regional significance</td>
<td>Moderate visual impact expected</td>
<td>High visual impact expected</td>
<td>High visual impact expected</td>
<td>Very high visual impact expected</td>
<td>Very high visual impact expected</td>
<td>Very high visual impact expected</td>
</tr>
<tr>
<td>Areas or routes of high scenic, cultural, historical significance</td>
<td>Minimal visual impact expected</td>
<td>Moderate visual impact expected</td>
<td>High visual impact expected</td>
<td>High visual impact expected</td>
<td>Very high visual impact expected</td>
<td>Very high visual impact expected</td>
</tr>
<tr>
<td>Areas or routes of medium scenic, cultural or historical significance</td>
<td>Little or no visual impact expected</td>
<td>Minimal visual impact expected</td>
<td>Moderate visual impact expected</td>
<td>High visual impact expected</td>
<td>High visual impact expected</td>
<td>High visual impact expected</td>
</tr>
<tr>
<td>Areas or routes of low scenic, cultural, historical significance / disturbed</td>
<td>Little or no visual impact expected. Possible benefits</td>
<td>Little or no visual impact expected</td>
<td>Minimal visual impact expected</td>
<td>Moderate visual impact expected</td>
<td>High visual impact expected</td>
<td>High visual impact expected</td>
</tr>
<tr>
<td>Disturbed or degraded sites / run-down urban areas / wasteland</td>
<td>Little or no visual impact expected. Possible benefits</td>
<td>Little or no visual impact expected</td>
<td>Little or no visual impact expected</td>
<td>Minimal visual impact expected</td>
<td>Moderate visual impact expected</td>
<td>Moderate visual impact expected</td>
</tr>
</tbody>
</table>

Table 3 describes the category of visual impact assessment. With regards to the proposed Umsobomvu WEF, a noticeable change in the visual character of the area, and a new precedent for development may be expected.

**Table 3: Description of the key categories of visual impact expected.**

**Very high visual impact expected:**
Potentially significant effect on wilderness quality or scenic resources; Fundamental change in the visual character of the area; Establishes a major precedent for development in the area.

**High visual impact expected:**
Potential intrusion on protected landscapes or scenic resources; Noticeable change in visual character of the area; Establishes a new precedent for development in the area.

**Moderate visual impact expected:**
Potentially some effect on protected landscapes or scenic resources; Some change in the visual character of the area; Introduces new development or adds to existing development in the area.

**Minimal visual impact expected:**
Potentially low level of intrusion on landscapes or scenic resources; Limited change in the visual character of the area; Low-key development, similar in nature to existing development.

**Little or no visual impact expected:**
Potentially little influence on scenic resources or visual character of the area; Generally compatible with existing development in the area; Possible scope for enhancement of the area.

Based on the above considerations, the approach adopted for the Umsobomvu WEF VIA is that prescribed for a development or activity where a high visual impact is expected.
According to the DEA&DP guideline, this will require a Level 4 Visual Assessment

<table>
<thead>
<tr>
<th>Approach</th>
<th>Type of issue (see Box 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of visual input recommended</td>
<td>Little or no visual impact expected</td>
</tr>
<tr>
<td>Level 1 visual input</td>
<td>Level 2 visual input</td>
</tr>
</tbody>
</table>

A Level 4 Visual Assessment consists of the following main elements:
- Identification of issues raised in scoping phase, and site visit;
- Description of the receiving environment and the proposed project;
- Establishment of view catchment area, view corridors, viewpoints and receptors;
- Indication of potential visual impacts using established criteria;
- Description of alternatives, mitigation measures and monitoring programmes; and
- 3D modelling and simulations.

2.2 Glossary of terms relevant to the VIA

**View shed**
The outer boundary defining a view catchment area, usually along crests and ridgelines.

**Viewpoint**
A selected point in the landscape from which views of a particular project or other feature can be obtained.

**View corridor**
A linear geographic area, usually along movement routes, that is visible to users of the route.

**View catchment area**
A geographic area, usually defined by the topography, within which a particular project or other feature would generally be visible. Sometimes called the visual envelope.

**Sense of place**
The unique quality or character of a place, whether natural, rural or urban. Relates to uniqueness, distinctiveness or strong identity. Sometimes referred to as genius loci meaning 'spirit of the place'.

**Visual absorption capacity**
The ability of an area to visually absorb development as a result of screening topography, vegetation or structures in the landscape.
3 VISUAL ASSESSMENT INFORMATION

3.1 Relevant project information

InnoWind (Pty) Ltd. proposes the development of a wind energy facility (WEF) on the border between the Northern Cape and Eastern Cape Provinces. In the Northern Cape, the proposed WEF falls within the Umsobomvu Local Municipality in the Pixley ka Seme District Municipality and the Inxuba Yethemba Local Municipality and Chris Hani District Municipality in the Eastern Cape. The wind farm will host up to approximately eighty (80) turbines, with a potential power output of one hundred and forty (140) megawatts (MW).

3.1.1 Details and nature of structures

The wind farm will include up to 80 turbines (1.5 – 4.0 MW output each), with a total maximum output capacity of 140 megawatts (MW).

• A rotor, or blades, which are the portion of the wind turbine that collect energy from the wind and convert the wind's energy into rotational shaft energy to turn the generator. The speed of rotation of the blades is controlled by the nacelle, which can turn the blades to face into the wind (‘yaw control’), and change the angle of the blades (‘pitch control’) to make the most use of the available wind. The maximum rotor diameter for the Umsobomvu WEF turbines is approximately 132m.

• A nacelle (enclosure) containing a drive train, usually including a gearbox (some turbines do not require a gearbox) and a generator. The generator is what converts the turning motion of a wind turbine’s blades (mechanical energy) into electricity. Inside this component, coils of wire are rotated in a magnetic field to produce electricity. The nacelle is also fitted with brakes, so that the turbine can be switched off during very high winds, such as during storm events. This prevents the turbine from being damaged. All this information is recorded by computers and is transmitted to a control centre, which means that operators don’t have to visit the turbine very often, but only occasionally for a mechanical check.

• A tower, to support the rotor and drive train; The tower on which a wind turbine is mounted is not only a support structure, but it also raises the wind turbine so that its blades safely clear the ground and so can reach the stronger winds at higher elevations. The tower must also be strong enough to support the wind turbine and to sustain vibration, wind loading, and the overall weather elements for the life time of the turbine. The maximum hub height of the Umsobomvu WEF turbines is approximately 137m.

• Electronic equipment such as controls, electrical cables, ground support equipment, and interconnection equipment.

The tower and turbine design and colour will be optimised to minimise visual impact. A South African example of a set of wind turbines is given in Figure 1.
3.1.2 Other structures and activities

Additional infrastructure required during construction will include the following:
- A maximum of 10 000m² temporary lay down area;
- Internal access roads;
- A contractor's site office of up to 5 000m²;
- Administration and warehouse buildings with a footprint of 5 000m²;
- Fencing, linking station and borrow pits if required;
- Hard stand areas associated with each turbine base for crane operation during construction; and
- An onsite substation.

3.2 Description of the affected physical environment (as described in the Scoping Report)

The proposed wind energy facility (WEF) would be located on the border between the Northern Cape and Eastern Cape Provinces. The following sections provide a description of the current state of the physical environment.
3.2.1 Current Land Use
The proposed WEF falls within both the Northern Cape and the Eastern Cape Provinces. In the Northern Cape, it falls within the Umsobomvu Local Municipality in the Pixley ka Seme District Municipality and in the Eastern Cape in the Inxuba Yethemba Local Municipality and Chris Hani District Municipality.

The specific region, concerned with the Umsobomvu WEF, is part of the Dry Highveld Grassland Bioregion and the Nama-Karoo Biome. It consists of Besemkaree koppies shrubland in the high lying areas and Eastern Upper Karoo in the lower lying areas. Portions of the proposed area are used for ecotourism and agriculture. The ecotourism entails hiking trails and the primary agricultural practices include subsistence and commercially farmed livestock.

Land uses in the landscape adjacent to the proposed Umsobomvu WEF include:
- Horse breeding and horse riding shows (Saddle Horse and Boerperd)
- Commercial farming and subsistence farming
- Cattle, sheep and goat grazing and breeding
- Livestock feeding crops (such as Lucerne)
- Fruit trees

3.2.2 Climate
The Middelburg/Noupoort area typically receives between 234 and 261mm of rain per year, with most rainfall occurring during autumn. The area receives the lowest rainfall (2mm) in July and the highest (56mm) in March. The average midday temperatures range from 13.6°C in June to 30.2°C in January. The region is the coldest during July when the mercury drops to 0.2°C on average during the night.

3.2.3 Topography
The Umsobomvu WEF site has an average altitude of 1 750m. The surrounding areas consist of low lying, flat grasslands with undulating hills. The particular mountain scape on which the site is located is one the highest and most impressive in the region.

3.2.4 Geology and Soils
Approximately two thirds of South Africa is covered by sedimentary and volcanic rocks of the Karoo Supergroup which is made up of Volcanics (basalt and rhyolite); Sediments (sandstone, shale, siltstone); and dolerite.

Sandstone and shales are common sedimentary rocks. Sandstones are generally medium-grained clastic rocks composed of rounded or angular fragments of quartz in a cementing matrix. Shales consist of clay minerals and tiny fragments of quartz and/or other rock forming minerals. Dwyka tillite is compacted boulder clay of glacial origin.

3.2.5 Vegetation and floristics
The project area falls within two biomes; the Grassland Biome and the Nama-Karoo Biome. Grasslands are the second largest biome in South Africa and are widespread, ranging from sea level up to over 2000 meters above sea level. The Nama-Karoo biome is the third largest biome in South Africa and is situated in the western half of the country, stretching over the central plateau.

South African National Biodiversity Institute (SANBI)
Mucina and Rutherford (2006) developed the National Vegetation map as part of a South African National Biodiversity Institute (SANBI) funded project: “It was compiled in order to provide floristically based vegetation units of South Africa, Lesotho and Swaziland at a greater level of detail than had been available before.” The map was developed using a wealth of data from several contributors and has allowed for the best national vegetation map to date, the last being that of Acocks developed over 50 years ago. The SANBI Vegetation map informs finer scale bioregional plans such as STEP. This SANBI Vegmap project has two main aims:
“to determine the variation in and units of southern African vegetation based on the analysis and synthesis of data from vegetation studies throughout the region, and

to compile a vegetation map. The aim of the map was to accurately reflect the distribution and variation on the vegetation and indicate the relationship of the vegetation with the environment. For this reason the collective expertise of vegetation scientists from universities and state departments were harnessed to make this project as comprehensive as possible.”

The following vegetation types are found within the project area:

- **Besemkaree Koppies Shrubland**
  Besemkaree Koppies Shrubland occurs in the Northern Cape, Free State and Eastern Cape Provinces along the slopes of koppies, butts and tafelbergs. This vegetation type comprises of two layers; the lower layer is dominated by dwarf small-leaved shrubs, and in years with high rainfall, grasses. The upper layer is dominated by tall shrubs such as Rhus erosa, Rhus burchelli, Rhus ciliata, Eucliea crispa, Diospyros austro-africana and Olea europaea subsp. africana. This vegetation type is classified as Least Threatened as it is largely excluded from agricultural practices. The conservation target is 28% with 5% being conserved in the various reserves such as the Gariep Dam, Rolfontein, Tussen Die Riviere, Caledon and Kalkfontein Dam Nature Reserve.
  This vegetation type dominates the project area and occurs on slopes and high lying areas of the ridges. All the turbines occur within this vegetation type.

- **Eastern Upper Karoo**
  The Eastern Upper Karoo vegetation type occurs in the Northern Cape, Eastern Cape and Western Cape and is associated with a flat to gently sloping topography. It is dominated by dwarf microphyllus shrubs and grasses belonging to the Aristida and Eragrostis genera. This vegetation type is classified as Least Threatened with a conservation target of 21%. A portion of this vegetation type has been conserved in Mountain Zebra and Karoo National Parks as well as in Oviston, Commando Drift, Rolfontein and Gariep Dam Nature Reserves.
  This vegetation type occurs in the low lying, flat areas of the project area and will be impacted on by access roads and powerlines.
4 ASSESSMENT OF IMPACTS

4.1 Potential visual impacts

The main issues relating to visual and aesthetic impacts can be summarised as follows:
- Impacts of design and built-form (e.g. use of building materials, height of structures, incongruence with surrounding buildings) on aesthetic character of the area; The establishment of wind turbines introduces very large structures of unprecedented height and form;
- Impacts of the overall development on sense of place and sense of privacy of the area;
- Impacts of lighting: The proposed facility may be a (cumulative) source of light pollution. Sources include security lighting at substations and other important infrastructural elements, after hour operational lighting, and aircraft warning lights mounted on the hub of the turbines.

4.2 Visual impact assessment criteria

Oberholzer (2005) recommends that the following specific visual impact assessment criteria should be considered. The proposed project should be considered against these criteria before attempting to assess the significance of the visual impacts.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>High</th>
<th>Moderate</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visibility of the 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.</td>
<td>High visibility – visible from a large area (e.g. several square kilometres).</td>
<td>Moderate visibility – visible from an intermediate area (e.g. several hectares).</td>
<td>Low visibility – visible from a small area around the project site.</td>
</tr>
<tr>
<td>Visual exposure – based on distance from the project to selected viewpoints. Exposure or visual impact tends to diminish exponentially with distance.</td>
<td>High exposure – dominant or clearly noticeable;</td>
<td>Moderate exposure – recognisable to the viewer;</td>
<td>Low exposure – not particularly noticeable to the viewer;</td>
</tr>
<tr>
<td>Visual sensitivity of the area – the inherent visibility of the landscape, usually determined by a combination of topography, landform, vegetation cover and settlement pattern. This translates into visual sensitivity.</td>
<td>High visual sensitivity – highly visible and potentially sensitive areas in the landscape.</td>
<td>Moderate visual sensitivity – moderately visible areas in the landscape.</td>
<td>Low visual sensitivity – minimally visible areas in the landscape.</td>
</tr>
<tr>
<td>Visual sensitivity of Receptors – The level of visual impact considered acceptable is dependent on the type of receptors.</td>
<td>High sensitivity – e.g. residential areas, nature reserves and scenic routes or trails;</td>
<td>Moderate sensitivity – e.g. sporting or recreational areas, or places of work;</td>
<td>Low sensitivity – e.g. industrial, mining or degraded areas.</td>
</tr>
<tr>
<td>Visual absorption capacity (VAC) - the potential of the landscape to conceal the proposed project, i.e.</td>
<td>Low VAC - e.g. little screening by topography or vegetation.</td>
<td>Moderate VAC - e.g. partial screening by topography and vegetation;</td>
<td>High VAC – e.g. effective screening by topography and vegetation;</td>
</tr>
<tr>
<td>Visual intrusion – the level of</td>
<td>High visual</td>
<td>Moderate visual</td>
<td>Low visual</td>
</tr>
</tbody>
</table>
compatibility or congruence of the project with the particular qualities of the area, or its 'sense of place'. This is related to the idea of context and maintaining the integrity of the landscape or townscape.

**intrusion** – results in a noticeable change or is discordant with the surroundings;

**intrusion** – partially fits into the surroundings, but clearly noticeable;

**intrusion** – minimal change or blends in well with the surroundings.

**Note:** Various components of the project, such as the structures, lighting or power-lines, may have to be rated separately, as one component may have fewer visual impacts than another. This could have implications when formulating alternatives and mitigations.

### 4.2.1 Visibility of the project

As noted above, the visibility of the project refers to 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. Categories of visibility are given below.

- **High visibility** – visible from a large area (e.g. several square kilometres).
- **Moderate visibility** – visible from an intermediate area (e.g. several hectares).
- **Low visibility** – visible from a small area around the project site.

### 4.2.2 Visual Sensitivity and Visual Intrusion

Visual sensitivity is the inherent visibility of the landscape, usually determined by a combination of topography, landform, vegetation cover and settlement pattern. This translates into visual sensitivity. Categories of visual sensitivity are given below.

- **High visual sensitivity** – highly visible and potentially sensitive areas in the landscape.
- **Moderate visual sensitivity** – moderately visible areas in the landscape.
- **Low visual sensitivity** – minimally visible areas in the landscape

Visual intrusion is the level of compatibility or congruence of the project with the particular qualities of the area, or its 'sense of place'. This is related to the idea of context and maintaining the integrity of the landscape or townscape.

- **High visual intrusion** – results in a noticeable change or is discordant with the surroundings;
- **Moderate visual intrusion** – partially fits into the surroundings, but clearly noticeable;
- **Low visual intrusion** – minimal change or blends in well with the surroundings.

### 4.2.3 Visual exposure and sensitivity of receptors

Visual exposure is based on distance from the project to selected viewpoints. Exposure or visual impact tends to diminish exponentially with distance. Categories recommended by Oberholzer (2005) are given below:

- **High exposure** – dominant or clearly noticeable;
- **Moderate exposure** – recognisable to the viewer;
- **Low exposure** – not particularly noticeable to the viewer.

In this report the following distances from the site are used as proxy for categories of exposure:

- **High exposure** – 0 to 2.5km from the development.
- **Moderate exposure** – 2.6 to 5km from the development.
- **Low exposure** – greater than 5km from the development.

The level of visual impact considered acceptable is dependent on the type of receptors. Sensitivity categories are listed below.

- **High sensitivity** – e.g. residential areas, nature reserves and scenic routes or trails;
- **Moderate sensitivity** – e.g. sporting or recreational areas, or places of work;
- **Low sensitivity** – e.g. industrial, mining or degraded areas.
4.3 Assessment of visual impacts from selected observer points.

Photographs from observer points were taken during the field visit on the 23-26th September 2014. These observer points are provided on the map below and are explained in the following pages. The explanation includes an assessment of each sensitive visual receptor and includes the cumulative impact of the proposed.

Potentially important receptors include (As per Figure 2):
1. Point 1
2. Point 2
3. Point 3
4. Point 4
5. Point 5
6. Point 6
7. Point 7

Figure 3 is a view shed analysis of the proposed wind turbines and it indicates the turbine visibility from a distance of 2.5 km, 5 km, 10 km and 20km.

Figure 2: Google Earth view of the locations of the visual view points (red markers) and proposed wind turbines (black and white markers)
Figure 3: Viewshed analysis of the proposed wind turbines
4.3.1 Point 1

Coordinates: 31°16'21.95" S (Latitude), 24°48'11.41" E (Longitude)

Elevation: 1 490m

Closest turbine: 3 056m

Point 1 is an indication of the visibility of the proposed WEF from the intersection of the N10 and the gravel access road to Mr Lindo van der Merwe’s farm. Figure 4(a) is a Google Earth image comprising actual-sized turbine models as a representation of the visual impact that the proposed WEF will have on the surrounding landscape. Figure 4(b) is a panoramic photograph of the landscape, facing the same direction as the Google Earth image in figure 4(a), in its current state.

![Google Earth view and Panoramic view from Point 1 towards the proposed development](image-url)
4.3.2 Point 2

Coordinates: 31°17'26.59" S (Latitude), 24°47'06.93" E (Longitude)

Elevation: 1 489m

Closest turbine: 2 815m

Point 2 is an indication of the visibility of the proposed WEF from the gravel access road on the way to Mr Lindo van der Merwe’s farm. Figure 5(a) is a Google Earth image comprising actual-sized turbine models as a representation of the visual impact that the proposed WEF will have on the surrounding landscape. Figure 5(b) is a panoramic photograph of the landscape, facing the same direction as the Google Earth image in figure 5(a), in its current state.
4.3.3  **Point 3**

**Coordinates:** 31°17'43.49" S (Latitude), 24°46'15.59" E (Longitude)

**Elevation:** 1 502m

**Closest turbine:** 4 034m

Point 3 is an indication of the visibility of the proposed WEF from the gravel access road on the way to Mr Lindo van der Merwe's farm. Figure 6(a) is a Google Earth image comprising actual-sized turbine models as a representation of the visual impact that the proposed WEF will have on the surrounding landscape. Figure 6(b) is a panoramic photograph of the landscape, facing the same direction as the Google Earth image in figure 6(a), in its current state.

![Google Earth view and Panoramic view from Point 3 towards the proposed development](image-url)
4.3.4 **Point 4**

Coordinates: 31°18'53.53" S (Latitude), 24°44'41.92" E (Longitude)

Elevation: 1 509m

Closest turbine: 6 099m

Point 4 is an indication of the visibility of the proposed WEF from one of the gravel access roads. Figure 7(a) is a Google Earth image comprising actual-sized turbine models as a representation of the visual impact that the proposed WEF will have on the surrounding landscape. Figure 7(b) is a panoramic photograph of the landscape, facing the same direction as the Google Earth image in figure 7(a), in its current state.

![Figure 7: (a) Google Earth view and (b) Panoramic view from Point 4 towards the proposed development](image-url)
4.3.5 **Point 5**

**Coordinates:** 31°19'51.40" S *(Latitude)*, 24°41'55.97" E *(Longitude)*

**Elevation:** 1 474m

**Closest turbine:** 7 855m

Point 5 is an indication of the visibility of the proposed WEF from one of the gravel access roads. Figure 8(a) is a Google Earth image comprising actual-sized turbine models as a representation of the visual impact that the proposed WEF will have on the surrounding landscape. Figure 8(b) is a panoramic photograph of the landscape, facing the same direction as the Google Earth image in figure 8(a), in its current state.

![Google Earth view and Panoramic view from Point 5 towards the proposed development](image)

<table>
<thead>
<tr>
<th>Shape Colour</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>RED</td>
<td>Turbines are clearly visible</td>
</tr>
<tr>
<td>ORANGE</td>
<td>Turbines are less visible</td>
</tr>
<tr>
<td>YELLOW</td>
<td>Turbines are barely visible</td>
</tr>
</tbody>
</table>
4.3.6  Point 6

Coordinates: 31°24’39.00” S (Latitude), 24°38’50.47” E (Longitude)

Elevation: 1 438m

Closest turbine: 8 872m

Point 6 is an indication of the visibility of the proposed WEF from one of the gravel access roads. Figure 9(a) is a Google Earth image comprising actual-sized turbine models as a representation of the visual impact that the proposed WEF will have on the surrounding landscape. Figure 9(b) is a panoramic photograph of the landscape, facing the same direction as the Google Earth image in figure 9(a), in its current state.

Figure 9: (a) Google Earth view and (b) Panoramic view from Point 6 towards the proposed development
4.3.7 **Point 7**

**Coordinates:** 31°25'46.95" S (Latitude), 24°39'07.53" E (Longitude)

**Elevation:** 1 449m

**Closest turbine:** 8 760m

Point 7 is an indication of the visibility of the proposed WEF from one of the gravel access roads. Figure 10(a) is a Google Earth image comprising actual-sized turbine models as a representation of the visual impact that the proposed WEF will have on the surrounding landscape. Figure 10(b) is a panoramic photograph of the landscape, facing the same direction as the Google Earth image in figure 10(a), in its current state.

Figure 10: (a) Google Earth view and (b) Panoramic view from Point 7 towards the proposed development.
4.4 Distance: Diminishing Impact

The following images illustrate how distance diminishes the visual impact of turbines. The first image is a 3D model layout of a turbine in the Umsobomvu WEF layout. These images show that the turbine starts to diminish on the horizon as you move further away (as expected). Figure 11 and 12 illustrate the distance at which the turbine structures start to diminish. Figure 12 illustrates the distance from the R75 road, indicating that the visual impact of the turbines is minimal when the turbine is more than 5km away from the viewpoint.

![Wind turbine diminishing effect A](image)

Figure 11: Wind turbine diminishing effect A
Figure 12: Wind turbine diminishing effect B
5 ASSESSMENT OF SIGNIFICANCE

This section analyses the specific issues associated with the proposed Umsobomvu WEF and assesses the significance of impacts pre- and post-mitigation.

5.1 Consideration of alternatives

Integral to the EIA process is the consideration and evaluation of alternatives to the proposed development plan. This is also applicable when conducting specialist studies including visual impact assessments. In the case of the proposed Umsobomvu WEF, the following “alternatives” are relevant:

• No development

The “no-development” option should always be considered as an alternative. This is not automatically the optimal environmental option, as a site may not have intrinsic conservation value. In addition, from a socio-economic perspective a development of the site may contribute to some extent to socio-economic upliftment through, for example local investment in the area. In the case of the Umsobomvu WEF, the development can have local job-creation benefits, while at the same time adding to the energy security of the region.

5.2 Approach to assessment of significance

Criteria used for the assessment of visual significance are detailed below:

Criteria used for the assessment of impacts

Nature of the impact - an appraisal of the visual effect the activity would have on the receiving environment. This description should include visual and scenic resources that are affected, and the manner in which they are affected, (both positive and negative effects).

Extent – the spatial or geographic area of influence of the visual impact, i.e.:
- site-related: extending only as far as the activity;
- local: limited to the immediate surroundings;
- regional: affecting a larger metropolitan or regional area;
- national: affecting large parts of the country;
- international: affecting areas across international boundaries.

Duration - the predicted life-span of the visual impact:
- short term, (e.g. duration of the construction phase);
- medium term, (e.g. duration for screening vegetation to mature);
- long term, (e.g. lifespan of the project);
- permanent, where time will not mitigate the visual impact.

Intensity – the magnitude of the impact on views, scenic or cultural resources.
- low, where visual and scenic resources are not affected;
- medium, where visual and scenic resources are affected to a limited extent;
- high, where scenic and cultural resources are significantly affected.

Probability – the degree of possibility of the visual impact occurring:
- improbable, where the possibility of the impact occurring is very low;
- probable, where there is a distinct possibility that the impact will occur;
- highly probable, where it is most likely that the impact will occur; or
- definite, where the impact will occur regardless of any prevention measures.

Significance – The significance of impacts can be determined through a synthesis of the aspects produced in terms of their nature, duration, intensity, extent and probability, and be described as:
- low, where it will not have an influence on the decision;
- medium, where it should have an influence on the decision unless it is mitigated; or
- high, where it would influence the decision regardless of any possible mitigation.

### 5.2.1 Establishing thresholds of significance

Oberholzer (2005) notes that thresholds of significance define the level or limit at which point an impact changes from low to medium significance, or medium to high significance. These thresholds are often determined by current societal values which define what would be acceptable or unacceptable to society and may be expressed in the form of legislated standards, guidelines or objectives. However, unlike water quality or air quality, thresholds for visual or scenic quality cannot be easily quantified, as they tend to be abstract, and often relate to cultural values or perceptions. A second difficulty is that natural, rural and urban landscapes are constantly changing, and the assessment will therefore need to consider this in determining the significance of impacts. A third difficulty may be the divergence of opinion on what constitutes ‘acceptable’ change, by the individual, the community or society in general.

The visual assessment should recognise that some change to the landscape over time is inevitable with the expansion of urban areas and introduction of new technologies, such as communication masts. This will have a bearing on significance ratings, particularly in identified growth areas.

### 5.3 Direct and indirect effects

The visual impact assessment must also consider potentially significant direct and indirect impacts of a proposed activity. Definitions and components are provided below:

- Direct (or primary) effects occur at the same time and in the same space as the activity - for example, the loss of views through construction of buildings.

- Indirect (or secondary) effects occur later in time, or at a different place, from the causal activity. For example, the construction of power lines leading to a subsequent drop in property values in the surrounding area.
5.4 Assessment

The following table gives the assessment of significance of visual and aesthetic impacts associated with the proposed Umsobomvu WEF.

### 5.4.1 Planning and Design Phase: Direct Visual Impacts

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<td>LONG TERM</td>
<td>LOW</td>
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<td>MODERATE</td>
<td>Vegetation screening along sections of the road that are frequented by individuals who feel that they are impacted.</td>
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</tr>
</tbody>
</table>

No-Go Option

The no-go option will mean that the landscape will remain visually intact. However; the no-go option will also result in the absence of the benefits which could be accrued (as per the social impact assessment) due to the presence of the wind energy facility.
5.4.2 **Indirect impacts (all phases)**
The WEF layout is proposed near the N9 and N10 (National Road) and in close proximity to gravel (farm) roads. The turbine proposed closest to the National Road lies approximately 2km from the road. The turbines may have an indirect impact on motorists who are distracted by the turbine structures and the alteration of the landscape may impact farmers’ sense of place.

5.5 **Mitigation Measures**

5.5.1 **Mitigation against lighting**

**Security and operational lighting**
- Sub-stations and other facilities, where practical, should be situated off the ridgelines so as to minimise the view catchment of associated lighting.
- All lighting should be fitted with deflectors to avoid light spillage and minimise visual impact of lights at night. The developer should specifically plan the type, placement and direction of lighting to ensure that light pollution is minimised.

5.5.2 **Mitigation against visual intrusion in the landscape**

The proposed facility is large and could dominate the landscape for those in close proximity to the development. Considering the size and extent of the facility, the options for “concealing” the development are limited. Recommended mitigation measures may include:
- Increase the visual absorption capacity of the landscape around farm houses and roads in close proximity (<2.5kms) to the development by supporting tree-planting programmes.

5.6 **Beneficiaries and losers in regard to impacts**

In assessing the significance of impacts, Oberholzer (2005) recommends that beneficiaries and losers be specifically identified. In the case of the Umsobomvu WEF, the benefits are likely to be both local and regional in character.

Local benefits accrue in terms of job creation and local economic development, including short term and permanent direct jobs (e.g. construction, maintenance and security), and indirect jobs associated with supporting services.

Regional and National benefits accrue in regard to energy security (particularly in the context of national energy shortages) and national obligations for the reduction of greenhouse gas emissions.
6 CONCLUSIONS AND RECOMMENDED MANAGEMENT ACTIONS

The Umsobomvu WEF covers a large area of land which is visible from the N10 as well as local farm houses and farm roads. Most of the visual points range between 2.5 and 9km from the proposed development. Where possible, the turbines have been positioned in areas which are sheltered by the topography of the landscape. Depending on the where about of the view point, the overall visibility and sensitivity may vary from LOW to MODERATE, none of the turbine points were regarded as having an overall significance that is HIGH. On comparison of Layout Alternative 1 versus Layout Alternative 2, no changes were made to the overall impact of the WEF and both layouts are therefore considered to be acceptable.

However, overall, it is concluded that for all view points, the impact is:
  - LOW, where the impact should have an influence on the decision unless it is mitigated.

The assessment of these impacts was undertaken in terms of the following visual assessment criteria:

- Visibility of the project;
- Visual exposure;
- Visual sensitivity of the area;
- Visual sensitivity of receptors;
- Visual absorption capacity; and
- Visual intrusion.

The following receptors were identified:
- Permanent:
  - Farm houses and farm access (gravel) roads
- Temporary:
  - N9 and N10 Road users

In assessing the direct impacts to visual resources, it has been recognised that, although the lifespan of the project is likely to extend for a number of decades, most of the superstructure can be removed on decommissioning. This means that although the proposed facility will undoubtedly have an impact on the visual resources of the area, it does not represent a completely irreversible loss of scenic resources.

The following mitigation measures are recommended:
- Lighting:
  - Sub-stations and other facilities should, where practical, be situated off the ridgelines so as to minimise the view catchment of the lighting;
  - All lighting should be fitted with defectors to avoid light spillage and minimise visual impact of lights at night. The developer should specifically plan the type, placement and direction of lighting to ensure that light pollution is minimised.
- Visual Intrusion in the Landscape
  - Increase the visual absorption capacity of the landscape around villages in closest proximity to the development by supporting tree-planting programmes.

Concluding Statement
The development will undoubtedly be imposing and dominate the visual landscape for those in close proximity. However,
- Based on the assessment of significance in this report;
- Given that the superstructures are technically removable on decommissioning;
- Given that the landscape will be restored to a natural state once the WEF is decommissioned;
- Given certain mitigation recommendations in this report;
- Given an understanding that although there are local losses, there are also other local, regional and national environmental, social and economic gains; and
Given authentic efforts to ensure certain benefits accrue to those in close proximity to the development.

The undulating nature of the landscape shields the majority of the wind turbines on site. The overall visual sensitivity of the site has been found to be LOW/MODERATE and it can therefore be concluded that potential losses of scenic resources are not sufficiently significant to present a fatal flaw to the proposed project.