PROPOSED DASSIES RIDGE WIND ENERGY PROJECT, EASTERN CAPE PROVINCE

AGRICULTURAL AND SOIL ASSESSMENT

DEA References: 14/12/16/3/3/2/643

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<table>
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<tr>
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<th>Responsibility</th>
<th>Signature</th>
<th>Date</th>
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</thead>
<tbody>
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<td>Specialist, author</td>
<td>[Signature]</td>
<td>10 October 2014</td>
</tr>
</tbody>
</table>

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INTRODUCTION

1.1 Project location

Dassiesridge Wind Power (Pty) Ltd. plans to develop, construct and operate a Wind Energy Facility (WEF) between the towns of Uitenhage and Kirkwood in The Eastern Cape Province (Figure 1.1). The proposed project area is approximately 14 315 ha located on 17 properties (Table 1.1).

![Figure 1.1. Locality map indicating the location of proposed Dassiesridge WEF.](image)

Table 1.1. Property portions and farm names associated with the project area.

<table>
<thead>
<tr>
<th>Farm Name</th>
<th>SG Digit Number</th>
<th>Portion / Farm Number</th>
<th>Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLAUW BAATJIES 189</td>
<td>C076000000000018900005</td>
<td>5/189</td>
<td>225</td>
</tr>
<tr>
<td>GRASSRIDGE 190</td>
<td>C076000000000019000003</td>
<td>3/190</td>
<td>547</td>
</tr>
<tr>
<td>PRENTICE KRAAL 233</td>
<td>C07600000000002300014</td>
<td>14/233</td>
<td>226</td>
</tr>
<tr>
<td>PRENTICE KRAAL 233</td>
<td>C07600000000002300015</td>
<td>15/233</td>
<td>530</td>
</tr>
<tr>
<td>GRINGLEY 188</td>
<td>C076000000000018800000</td>
<td>188</td>
<td>534</td>
</tr>
<tr>
<td>BLAUW BAATJIES 189</td>
<td>C076000000000018900002</td>
<td>RE/2/189</td>
<td>474</td>
</tr>
<tr>
<td>PRENTICE KRAAL 233</td>
<td>C076000000000023000004</td>
<td>4/233</td>
<td>159</td>
</tr>
<tr>
<td>BLAUW BAATJIES 189</td>
<td>C076000000000018900000</td>
<td>RE/189</td>
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<td>4/189</td>
<td>763</td>
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<td>3/189</td>
<td>553</td>
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<tr>
<td>GRASSRIDGE 187</td>
<td>C076000000000018700000</td>
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<td>1950</td>
</tr>
<tr>
<td>ELANDS HOORN 185</td>
<td>C076000000000018500011</td>
<td>11/185</td>
<td>854</td>
</tr>
</tbody>
</table>
1.2 Project description

The proposed Dassiesridge WEF will consist of up to 60 turbines each capable of generating approximately 3.3 Mega Watts (MW) of power depending on the model and size of turbine selected. The project is currently too early in its development phase to determine the exact wind turbine model that will be best suited for this site. The facility will have a maximum generating output of up to 183 MW, but the final design will be for a total capacity of 140 MW. This is due to the DoE’s cap on 140 MW on renewable energy projects. Although 60 turbines will be assessed, the final layout will comprise of between 42 and 47 turbines in total. The turbine footprints and associated facility infrastructure (internal access roads, substations, construction compound, batching plant and operations building) will potentially cover an area of approximately 68 ha depending on final layout design should the project proceed.

1.3 Alternatives

Two potential turbine technology options are being considered: the Vestas V126 type (3.3 MW) and the Acciona AW132 (3.3MW). An phase investigation of the wind regime of the site will decide the model of turbines to be installed.

No turbine layout or access route alternatives are proposed.

Four powerline routes and substation site alternative are proposed (Figure 1.2). Each alternative are shown in Table 1.2 below.

![Figure 1.2. Location of the 4 alternative powerline & substation sites.](image)
Table 1.2. Description of the 4 different powerline and substation alternatives for the proposed Dassiesridge WEF.

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Map</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td><img src="image1" alt="Alternative 1" /></td>
</tr>
<tr>
<td>A2</td>
<td><img src="image2" alt="Alternative 2" /></td>
</tr>
</tbody>
</table>
1.4 Infrastructure

Wind energy is a form of solar energy. Winds are caused by the uneven heating of the atmosphere by the sun, the irregularities of the earth's surface, and rotation of the earth. Wind flow patterns are modified by the earth's terrain, bodies of water, and vegetation. This wind flow or motion energy (kinetic energy) can be used for generating electricity. The term "wind energy" describes the process by which wind is used to generate mechanical power or electricity. Wind turbines convert the kinetic energy in the wind into mechanical power and a generator can then be used to convert this mechanical power into electricity. The components of a typical wind turbine subsystem are:

- **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,
- **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, and;
- **Electronic equipment** such as controls, electrical cables, ground support equipment, and interconnection equipment.

Additional infrastructure includes internal access roads, underground and overhead power lines, electrical switching stations and/or small substations and control buildings.

Below is an illustration of the proposed Dassiesridge WEF and associated infrastructure layout (Figure 1.3).
Figure 1.3. Proposed Dassiesridge WEF layout.
1.4.1 No-Go alternative

It is mandatory to consider the no-go (no development) alternative in the EIA process. The no development option assumes the site remains in its current state, i.e. agricultural land. The no-go alternative will be used as a baseline throughout the assessment process against which potential impacts will be compared in an objective manner.

1.5 Terms of reference

The following terms of reference was used as a guideline for the objectives of this agricultural assessment:

- Identify and assess all potential impacts (direct, indirect and cumulative) and economic consequences of the proposed development on soils and agricultural potential.
- Describe and map soil types (soil forms) and characteristics (soil depth, soil colour, limiting factors, and clay content of the top and sub soil layers.
- Describe the slope of the site.
- Determine the agricultural potential of the site.
- Describe current land use as well as possible alternative land use options.
- Provide recommended mitigation measures, monitoring requirements, and rehabilitation guidelines.

1.6 Approach

A desktop analysis and a field survey were undertaken. The methodology used is described below.

1.6.1 Desktop analysis

The desktop analysis was based on existing published data on soil and agricultural potential for the site. The source of data was the AGIS online database, produced by the Institute of Soil, Climate and Water of the Agricultural Research Council of South Africa (AGIS, 2007). This information was largely compiled from a nationwide survey of land types conducted since the 1970s. Satellite imagery of the site available on Google Earth™ was also used for evaluation.

The following specialist reports have been prepared as part of the EIA process and should also be read in conjunction with this report:

- Ecological Impact Assessment
- Socio-economic Impact Assessment

Where relevant summary content sourced from these documents is provided in this report.

1.6.2 Field survey

A field survey was conducted from 11th to the 12th of August 2014 in order to assess land-use, current soil conditions and agricultural use onsite.

Soil samples were also collected and sent to Brookside Laboratories Inc. in Heidelberg, Mpumalanga for analysis (see Appendix A for results).

The Guidelines for Soil Description (FAO 4th Ed. 2006) were used to assess the soils data according to international guidelines as set out in the second edition of the World Reference Base for Soil Resources (Deckers et al, 2006).
1.7 Limitations and assumptions

This report is based on currently available information and, as a result, the following limitations and assumptions are implicit –

- The report is based on a project description taken from design specifications for the proposed dassiesridge WEF project that have not yet been finalised, and which are likely to undergo a number of iterations and refinements before they can be regarded as definitive;
- Descriptions of the surrounding environment are based on limited fieldwork and available literature.
2 RELEVANT LEGISLATION

The following legislation and other regulatory instruments are directly relevant when considering impacts on the existing soil and agricultural uses identified for the Dassiesridge WEF project.

Table 2.1. Legislation and other regulatory instruments considered in the preparation of the Dassiesridge WEF Soil and Agricultural Report.

<table>
<thead>
<tr>
<th>Title of relevant legislation, policy or guideline</th>
<th>Date</th>
<th>Implications for proposed Dassiesridge WEF project</th>
</tr>
</thead>
<tbody>
<tr>
<td>The National Environmental Management Act (NEMA) (107 of 1998)</td>
<td>1998</td>
<td>The developer must apply the NEMA principles, the fair decision-making and conflict management procedures that are provided for in NEMA. The developer must apply the principles of Integrated Environmental Management and the consideration, investigation and assessment of the potential impact of existing and planned activities on the environment, socio-economic conditions; and the cultural heritage.</td>
</tr>
<tr>
<td>Conservation of Agricultural Resources Act (CARA)(No. 43 of 1983)</td>
<td>1983</td>
<td>The proposed project must conserve natural agricultural resources; Must assess the impacts of the proposed development on the existing agricultural environment; Must maintain the production potential of the land by:-  o Combating and preventing erosion;  o Preventing the weakening or destruction of water sources;  o Protecting vegetation;  o Combating weeds and invader plants.  o Cultivation of virgin soil.  o Protection of cultivated land.  o Utilisation and protection of the veld.  o Control of weed and invader plants.  o Prevention and control of veld fires and the restoration and reclamation of eroded land.</td>
</tr>
<tr>
<td>National Water Act (No. 36 of 1998)</td>
<td>1998</td>
<td>Provides details of measures intended to ensure the comprehensive protection of all water resources, including the ecological reserve (quantity and quality) for surface and underground water.</td>
</tr>
<tr>
<td>National Forests Act (No. 84 of 1998)</td>
<td>1998</td>
<td>The objective of this Act is to monitor and manage the sustainable use of forests. In terms of Section 12 (1) (d) of this Act and GN No. 1012 (promulgated under the National Forests Act), no person may, except under licence: Cut, disturb, damage or destroy a protected tree. Possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree.</td>
</tr>
<tr>
<td>The Subdivision of Agricultural Land Act (No. 70 of 1970)</td>
<td>1970</td>
<td>This Act controls the subdivision of all agricultural land in South Africa and prohibits certain actions relating to agricultural land. In terms of the Act, the owner of agricultural land is required to obtain consent from the Minister of Agriculture in order to subdivide agricultural land. The purpose of the Act is to prevent uneconomic farming units from being created and degradation of prime agricultural land. The Act also regulates leasing and selling of agricultural land as</td>
</tr>
<tr>
<td>Title of relevant legislation, policy or guideline</td>
<td>Date</td>
<td>Implications for proposed Dassiesridge WEF project</td>
</tr>
<tr>
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<tr>
<td></td>
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<td>well as registration of servitudes.</td>
</tr>
</tbody>
</table>

2.1 Municipal Policy

<table>
<thead>
<tr>
<th>Sundays River Valley Local Municipality Municipal by-laws</th>
<th>Certain activities related to the proposed development may, in addition to National legislation, be subject to control by municipal by-laws. These will need to be confirmed with the Sundays River Valley Local Municipality prior to construction.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spatial Development Frameworks (SDF)</td>
<td>Both the Nelson Mandela Metropolitan Municipality (NMMM) &amp; the Cacadu District Municipality (CDM) SDF’s identifies land use categories. The proposed Dassiesridge WEF fall within an area designated for agricultural land use in both SDF’s. Since the WEF activities are not mutually exclusive from farming activities, the proposed Dassiesridge WEF is not in conflict with the future spatial planning in either the NMMM or the CDM.</td>
</tr>
</tbody>
</table>
3 DESKTOP ANALYSIS

This section provides a brief of the current state of the natural environment of the proposed Dassiesridge WEF project in the Eastern Cape Province of South Africa.

3.1 Climate

Uitenhage (the closest town to the WEF site) normally receives about 331mm of rain per year, with rainfall occurring throughout the year. The average rainfall values for Uitenhage per month ranges between 17mm in June to 40mm in March. The monthly distribution of average daily maximum temperatures ranges from 19.8°C in July to 26.9°C in February. The region is the coldest during July when the temperature drops to 6.8°C on average during the night.

3.2 Geology

The dominant geological features within the affected farm portions of the proposed Dassiesridge WEF consists of sedimentary deposits of the Bokkeveld Group or rocks which makes up part of the much larger Cape Supergroup located in the western sections, as well as the much younger Uitenhage Group of rocks contained in the central and eastern sections of the proposed site (Figure 3.1). The Uitenhage Group represent successions of the fault-controlled Algoa Basin sediments and indicate the change from Jurassic to Cretaceous age rocks. This rock consists mainly of non-fossiliferous sandstones of both fluvial and estuarine origin of the Kirkwood Formation, overlain by grey clays, silts and sands of the Sondagsriver Formation. Scattered Tertiary deposits consisting of the Nanaga Formation sand and limestone as well as limestones, pebbly limestones and clays of the Alexandria Formation are also found on site.

![Figure 3.1. The geology of the proposed Dassiesridge WEF.](image-url)
The much older Devonian age rocks of the Bokkeveld Group are found in the western areas of the proposed site representing an extended timeframe (millions of years) of local surface erosion between these rocks and the much younger Jurassic and Cretaceous rock sequence found mostly in the central and eastern sections of the proposed Dassiesridge WEF site. The Bokkeveld rock consists of a series of alternating sandstone and shale formations.

### 3.3 Soils

Soils consist of shallow profiles with minimal development overlying rock. Water holding capacity are very low (<20–40mm) while the potential for water erosion is very high on slightly sloped landscapes to low on steep sloped landscapes.

### 3.4 Topography

The Dassiesridge WEF project site is characterised by undulating hills arranged on an east-west axis. The elevation ranges from 400 meters above sea level (masl) in the north western section of the project site to 215 masl in the southern section of the project site. The site is bordered by mountainous areas on the northern border which forms part of the Great Escarpment.

![Figure 3.2. The topography of the proposed Dassiesridge WEF.](image)

### 3.5 Vegetation

Mucina and Rutherford (2006) define the following vegetation types that occur within the Dassiesridge WEF site and associate infrastructure and from which source these descriptions are derived:
3.5.1 Sundays Thicket

This vegetation type is characterised by undulating plains and low mountains and foothills covered with tall dense thicket. Sundays Thicket is composed of a mosaic of predominantly spinescent species that include trees, shrubs and succulents. It is classified as LEAST THREATENED with a conservation target of 19% while 6% has been transformed by cultivation and urban development. This vegetation type occurs in the majority of the project site.

3.5.2 Coega Bontveld

Coega Bontveld is found in the Eastern Cape Province northeast of Port Elizabeth in the Coega area as well as in a few small patches in Addo. This vegetation type occurs on moderately undulating plains and is characterised by a mosaic of open grasslands and low thicket built mainly of bushclumps. It is often restricted to small patches in a matrix of typical valley thicket and is composed of a mixture of Fynbos, Grassland and Succulent Karoo elements. It is classified as LEAST THREATENED with a conservation target of 19%. While 10% has been conserved in the Greater Addo Elephant National Park and 6% has been transformed by cultivation and urbanisation.

However, it should be noted that the conservation status and significance of the Coega Bontveld has come under debate and is considered to be poorly protected. This is a result of its localised distribution in the Eastern Cape and due to the threat from mining activities in the area. Watson (2002) believes that development could push this vegetation type to near extinction unless it is properly managed.
Figure 3.3. Vegetation map of the proposed Dassiesridge WEF.
3.6 Surface hydrology

3.6.1 Rivers

No rivers are located within the Dassiesridge WEF site. The closest 2 rivers to the site are the Coega River to the south (approx. 3km from the nearest turbine) and the Bezuidenhouts River, a tributary of the Sondags River to the northeast (approx. 4km from the nearest turbine). Neither of these rivers will be impacted by the proposed Dassiesridge WEF development.

Various drainage systems transect the proposed Dassiesridge WEF site (Figure 3.5) and will be impacted by the proposed development.

![Figure 3.5. Main surface water drainage systems within the proposed Dassiesridge WEF site.](image)

3.6.2 Wetlands

No priority wetlands as defined by the National Freshwater Ecosystem Priority Area (NFEPA) were found within 500m of the proposed Dassiesridge WEF site (Figure 3.5). three stock dams were identified within the proposed WEF site, but will not be impacted by the proposed development.

3.7 Current land use

The region concerned with the Dassiesridge WEF consists of moderately undulating plains characterised by a mosaic of open grasslands and low thicket built increasing to dense thicket in elongated and narrow valleys. The entire project area is used for agriculture (game farming) with small sections along powerline alternatives 3 & 4 zoned for mining.

A number of scattered farmsteads are located within the project area.
Current land-uses in the landscape adjacent to the proposed Dassiesridge WEF include:

- A provincial road (R75) to the west of the project area.
- A municipal road (MR00470) running through the centre of the site from south to north.
- Protected area currently operated as the Grassridge Private Nature Reserve.
- Various Eskom powerline servitudes.
- PPC open surface mining
- Grassridge WEF (currently under construction)
- The town of Uitenhage located 18km to the south
- The small town of Sunland located 12km to the northeast.
This section presents the procedure to describe the different morphological and other characteristics of soils found within the Dassiesridge WEF site. Seven random points (shown in Figure 4.1 and Table 4.1) were identified within the Dassiesridge WEF area. These site selections were based on accessibility to the site. Soil samples were collected from each of these sites for laboratory assessment while the sites were visually assessed. The following procedure was followed during the field assessment:

1. Soil forms were confirmed as described in the World Reference Base (WRB) for Soil Resources (Deckers et al. 2006).
2. Soil families were identified as per the Soil Classification workbook, 1991.
3. The master horizons present in the profile were demarcated.
4. Diagnostic horizons or materials were identified.
5. The texture class of the A horizons were determined and added to the name or code of the soil family as per the Soil Classification workbook, 1991.

Figure 4.1. Locations of the 7 soil sample sites.

Table 4.1. Coordinates for the 7 soil sample sites.

<table>
<thead>
<tr>
<th>Site #</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>33° 34.907'S</td>
<td>25° 27.998'E</td>
</tr>
<tr>
<td>S2</td>
<td>33° 34.996'S</td>
<td>25° 27.782'E</td>
</tr>
<tr>
<td>S3</td>
<td>33° 35.424'S</td>
<td>25° 27.451'E</td>
</tr>
<tr>
<td>S4</td>
<td>33° 36.106'S</td>
<td>25° 31.021'E</td>
</tr>
<tr>
<td>S6</td>
<td>33° 36.047'S</td>
<td>25° 30.522'E</td>
</tr>
<tr>
<td>S7</td>
<td>33° 36.411'S</td>
<td>25° 29.073'E</td>
</tr>
<tr>
<td>S10</td>
<td>33° 38.113'S</td>
<td>25° 32.158'E</td>
</tr>
</tbody>
</table>
4.1 Soil classification

Based on a visual survey conducted during the site visit as well as soil samples collected from each area that was visually classified, the dominant soil forms (as per the WRB for Soil Resources) were identified within the Dassiesridge WEF site (Figure 4.2).

Figure 4.2. Soil map of the Dassiesridge WEF site.

4.1.1 Leptosols

A Leptosol is a very shallow young soil overlaying hard rock or a deeper soil that is extremely gravelly and/or stony (or a hard calcium carbonate – or calcrete - layer in the case of the Dassiesridge WEF). They are found mainly in mountainous and undulating regions and in areas where soil has been eroded to the extent that hard rock comes near to the surface.

Leptosols are unsuitable soils for rain fed or irrigation agriculture because of their inability to hold water, but have potential for tree crops or extensive grazing. These soils are extremely susceptible to surface erosion and active mitigation is sometimes required.

Within the Dassiesridge WEF area, leptosols are extensively utilised for game ranging, but cattle, sheep and goat grazing were historically practised.

All the proposed turbines will be located on leptosols with around 29 turbines located on rocky leptosols and 32 turbines located on calcareous leptosols.

Average soil depth ranges between 0 – 60cm with soil colours ranging between orange to red-brown on the rocky sub-layer and grey to light orange to brown on calcrete.

Below are visual representations of the soil type found within the Dassiesridge WEF site (Plate 4.1 – 4.3).
Plate 4.1. Shallow grey and light orange topsoil is typical of leptosols lying on top of a hard calcrete layer found within the Dassiesridge WEF site.
Plate 4.2. Shallow grey and light orange topsoil is typical of leptosols lying on top of a hard calcrete layer found within the Dassiesridge WEF site.
4.2 Soil forms

The South African soil classification system (per the Soil Classification workbook, 1991) classifies soils into two main categories or levels of classes namely an upper or general level containing SOIL FORMS and a lower, more specific class containing SOIL FAMILIES.

Soil forms are defined by their unique vertical sequence of diagnostic horizons and materials, while soil families have common properties within the form but are differentiated within the form on the basis of defining properties.

Two soil forms have been identified within the Dassiesridge WEF site namely:

- Coega Form, and
- Mispah Form

4.2.1 Coega form

This soil form consists of a shallow orthic A horizon overlying a hardpan carbonate layer acting as bedrock.

An orthic A horizon is a surface horizon that does not qualify as an organic, humic, vertic or melanic topsoil and may occur over the full range of soil forming conditions in South Africa.

A hardpan carbonate horizon is a continuous layer of cemented calcium carbonate that acts as a barrier to roots and is slowly impermeable to water.

The soil is further classified as NABIES SOIL FAMILY based on the fact that the A horizon were identified as non-calcareous.

This soil form is associated with leptosols overlying a hard calcrete base.

4.2.2 Mispah form

This soil form consists of a shallow orthic A horizon overlying hard rock.

In this case, hard rock is classified as horizontally orientated, hard, fractured sediments which do not have any distinct vertical channels containing soil material, and bedrock.

The A horizon are non-calcareous and not bleached and therefore are classified as MYHILL SOIL FAMILY

4.3 Laboratory results

See Appendix A for laboratory results.

All soil samples were collected on leptosols (shallow soils) as this was the only soil type identified onsite. Two different varieties of leptosols were identified namely leptosols overlying calcrete (also called Coega Soil Form) and leptosols overlying hard rock (also called Mispah Soil Form).

The Total Exchange Capacity (TEC) measured in ME/100g (see Laboratory results) was used to compare soil characteristics of the different soil samples. This was done as TEC is an inherent soil characteristic and is difficult to alter.
TEC refers to the total capacity of a soil to hold exchangeable cations. It influences the soil’s ability to hold onto essential nutrients and to provide a buffer against soil acidification therefore influencing soil structure stability, nutrient availability and soil pH. Soils with a higher clay and organic material content will have a higher TEC when compared to sandy soils. The following table reflects the TEC for different soil types.

Table 4.2. Total Exchange Capacity (TEC) for the different soil types (Moore et al., 1998).

<table>
<thead>
<tr>
<th>Soil type</th>
<th>TEC (ME/100g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand with low organic content</td>
<td>3-5</td>
</tr>
<tr>
<td>Sand with high organic content</td>
<td>10-20</td>
</tr>
<tr>
<td>Loam</td>
<td>10-15</td>
</tr>
<tr>
<td>Silty loam</td>
<td>15-25</td>
</tr>
<tr>
<td>Clay &amp; clay loams</td>
<td>20-50</td>
</tr>
<tr>
<td>Peat</td>
<td>50-100</td>
</tr>
</tbody>
</table>

Based on Table 4.2, soils within the Dassiesridge WEF site range from loamy soils (clay loams, silty loams and loam) in the shallow, grassland, calcrete subbasement areas (soil samples 1, 2, 4, 6, 10) while the soils in the lower lying valleys (samples 3 & 10) are considered as clay-peat soils due to the accumulation of organic material in these lower lying vegetation rich valleys.

Based on the low levels of calcium (ranging between 3651 kg/ha and 27509 kg/ha), potassium (762 kg/ha and 1691 kg/ha) and magnesium (493 kg/ha and 540 kg/ha), these soils are not considered as optimal for crops and will require active soil management to improve soil conditions for potential future crops.

### 4.4 Impacts identified

The following issues were identified in this section:

<table>
<thead>
<tr>
<th>ISSUE</th>
<th>IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in erosion potential</td>
<td>An increase in hard surfaces (concrete foundations and roads) will increase run-off and potentially lead to soil erosion.</td>
</tr>
<tr>
<td>Soil profile disturbance and resultant decrease in soil agricultural capability</td>
<td>Excavations for the construction of the turbines and associated infrastructure will disturb the soil profile. If topsoil becomes buried, or subsoil rock, that is less suitable for root growth, remains at the surface, the agricultural suitability of the soil, that will become available for agriculture again after decommissioning of the WEF, will be reduced.</td>
</tr>
<tr>
<td>Management of hazardous chemicals</td>
<td>Soil contamination and a loss of fertile soils.</td>
</tr>
<tr>
<td>Soil stockpiling management</td>
<td>Incorrect stockpiling of soil will result in a decrease of agricultural viability / potential.</td>
</tr>
</tbody>
</table>
5 AGRICULTURE

5.1 Agriculture in South Africa

Agriculture employ around 9% of the formal employment in South Africa, as well as providing work for casual labourers and contributing around 2.6% to the GDP for the nation (Stats SA, 2011 census). Due to the aridity of the land in general, only 13.5% of all land can be used for crop production, of that only 3% is considered high potential agricultural land (Mohamed, 2000).

According to Stats SA (2011 census), South Africa is one of world’s largest producers of: chicory roots (4th); grapefruit (4th); cereals (5th); green maize and maize (7th); castor oil seed (9th); pears (9th); sisal (10th); fibre crops (10th). The dairy industry consists of around 4,300 milk producers providing employment for 60,000 farm workers and contributing to the livelihoods of around 40,000 others.

5.2 Agriculture in the Dassiesridge WEF site

Historical agricultural practices in the area consisted of cattle farming. Recently, land usage has shifted to conservation with the main focus on game ranching and hunting. No other agricultural activities are currently practiced within the proposed Dassiesridge WEF site.

5.3 Site assessment

A field survey was conducted between the 10th to the 14th of March 2014 in order to assess agricultural practises onsite.

5.3.1 Game ranching

In terms of game ranching, game is considered to be an agricultural product as defined in the Marketing of Agricultural Products Act, 1996 (Act 47 of 1996).

Game ranching in South Africa is one of the fastest-growing sectors of the agricultural industry. Since the 1970’s, there has been a huge shift from cattle farming to game ranching. Provided they observe approved game-fencing rules, registered game ranches have permission to hunt throughout the year.

There are approximately 15 000 farms in South Africa on which game freely occur. On about 8 000 game-fenced ranches, some form of income-generating commercial game ranching is practised, earning some R767 million. The total surface area on which game is kept in South Africa amounts to more than 21 million ha of which 15 million ha of this land under wildlife are in the hands of the private sector, with the rest belonging to government institutions such as national parks and nature reserves. Approximately 200 000 local hunters use game on game ranches and conservation areas and earn a further income of approximately R113 million annually from an estimated 5 000 foreign trophy hunters. The total local market in live game trade is estimated at R100 million annually. Marketing of venison in South Africa is estimated at R20 million annually, but a large potential for growth is envisaged, also for venison exports. The game industry generates about R1 073 million annually, which amounts to 2.3% of the South African agricultural sector’s contribution to the country’s GDP. Game ranches in South Africa supply work for approximately 56 000 people, paying salaries of about R410 million annually.

Lange game occurring within the Dassiesridge WEF site includes:

- Kudu
- Impala
- Warthog
- Bushbuck
5.4 Agricultural potential

Agricultural potential in the Dassiesridge WEF area is classified according to the land potential classification system of the Department of Agriculture (part of the Department of Agriculture, Forestry and Fisheries). This classification system takes factors such as climate, soil and slope into consideration to determine agricultural potential. Although it provides only a macro perception of the agricultural potential in the region, it is still a fair indication of what the broader agricultural potential of the area is.

DAFF has classified the Dassiesridge WEF into the following agricultural potential class:

- Non-arable land with a low to moderate potential for grazing.

5.5 Impacts identified

The following issues were identified in this section:

<table>
<thead>
<tr>
<th>ISSUE</th>
<th>IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establishment of renewable energy infrastructure on agricultural land</td>
<td>Loss of up to 35 ha of low to moderate potential agricultural land as a result of new WEF infrastructure development.</td>
</tr>
<tr>
<td></td>
<td>Gradual reduction of available agricultural land as a consequence of an increase in renewable energy development in the local area.</td>
</tr>
<tr>
<td>Increased risk of fires from construction activities</td>
<td>Potential loss of crops, grazing and livestock as a result of fires originating from the construction site.</td>
</tr>
</tbody>
</table>
6 IMPACT IDENTIFICATION AND ASSESSMENT

6.1 Introduction

This chapter details the potential soils and agricultural impacts identified. For each issue identified, details are provided, followed by the mitigation measures required to minimise the negative impacts associated with the issue.

6.2 Impacts on soils and agriculture

Impacts on the agricultural potential of the affected land were identified during the Construction and Operation Phase of the proposed Dassiesridge WEF project and are described below. These included the consideration of direct, indirect and cumulative impacts that may occur. Issues and impacts are summarised in Table 6.1.

Table 6.1 Impacts to soil and agriculture associated with different phases of the proposed Dassiesridge WEF.

<table>
<thead>
<tr>
<th>Development Phase</th>
<th>Issue</th>
<th>Nature of Impact</th>
<th>Description of Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>1. Management of hazardous chemicals</td>
<td>Direct</td>
<td>1.1. Soil contamination and a loss of fertile soils as a result of hazardous chemical spills.</td>
</tr>
<tr>
<td></td>
<td>2. Increased risk of fires from construction activities</td>
<td>Direct</td>
<td>2.1. Potential loss grazing and game as a result of fires originating from the construction site.</td>
</tr>
<tr>
<td></td>
<td>3. Soil stockpiling management</td>
<td>Direct, Indirect</td>
<td>3.1. Incorrect stockpiling of soil will result in a decrease of agricultural viability/potential.</td>
</tr>
<tr>
<td></td>
<td>4. Soil profile disturbance and resultant decrease in soil agricultural capability</td>
<td>Direct</td>
<td>4.1. Excavations for the construction of the turbines and associated infrastructure will disturb the soil profile. If topsoil becomes buried, or subsoil rock, that is less suitable for root growth, remains at the surface, the agricultural suitability of the soil, that will become available for agriculture again after decommissioning of the WEF, will be reduced</td>
</tr>
<tr>
<td>Operation</td>
<td>5. Increase in erosion potential</td>
<td>Direct, Cumulative</td>
<td>5.1. An increase in hard surfaces (concrete foundations and roads) will increase run-off and potentially lead to soil erosion.</td>
</tr>
<tr>
<td></td>
<td>6. Establishment of renewable energy infrastructure on agricultural land</td>
<td>Direct, Cumulative</td>
<td>6.1. Loss of up to 35 ha of low to moderate agricultural land as a result of new WEF infrastructure development.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Direct</td>
<td>6.2. Gradual reduction of available agricultural land as a consequence of an increase in renewable energy development in the local area.</td>
</tr>
</tbody>
</table>

6.3 Assessment methodology
Five factors need to be considered when assessing the significance of impacts, namely:

1. Relationship of the impact to **temporal scales** - the temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact.

2. Relationship of the impact to **spatial scales** - the spatial scale defines the physical extent of the impact.

3. The **severity** of the impact - the severity/beneficial scale is used in order to scientifically evaluate how severe negative impacts would be, or how beneficial positive impacts would be on a particular affected system (for ecological impacts) or a particular affected party. The severity of impacts can be evaluated with and without mitigation in order to demonstrate how serious the impact is when nothing is done about it. The word ‘mitigation’ means not just ‘compensation’, but also the ideas of containment and remedy. For beneficial impacts, optimization means anything that can enhance the benefits. However, mitigation or optimization must be practical, technically feasible and economically viable.

4. The **likelihood** of the impact occurring - the likelihood of impacts taking place as a result of project actions differs between potential impacts. There is no doubt that some impacts would occur (e.g. loss of vegetation), but other impacts are not as likely to occur (e.g. vehicle accident), and may or may not result from the proposed development. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance.

Each criterion is ranked with scores assigned as presented in Table 6.1 to determine the overall significance of an activity. The criterion is then considered in two categories, viz. effect of the activity and the likelihood of the impact. The total scores recorded for the effect and likelihood are then read off the matrix presented in Table 6.2, to determine the overall significance of the impact. The overall significance is either negative or positive.

### Table 6.2. Ranking of Evaluation Criteria

<table>
<thead>
<tr>
<th>Effect</th>
<th>Temporal Scale</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short term</td>
<td>Less than 5 years</td>
<td>1</td>
</tr>
<tr>
<td>Medium term</td>
<td>Between 5-20 years</td>
<td>2</td>
</tr>
<tr>
<td>Long term</td>
<td>Between 20 and 40 years (a generation) and from a human perspective also permanent</td>
<td>3</td>
</tr>
<tr>
<td>Permanent</td>
<td>Over 40 years and resulting in a permanent and lasting change that will always be there</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spatial Scale</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Localised</td>
<td>At localised scale and a few hectares in extent</td>
</tr>
<tr>
<td>Study Area</td>
<td>The proposed site and its immediate environs</td>
</tr>
<tr>
<td>Regional</td>
<td>District and Provincial level</td>
</tr>
<tr>
<td>National</td>
<td>Country</td>
</tr>
<tr>
<td>International</td>
<td>Internationally</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Severity</th>
<th>Severity</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slight</td>
<td>Slight impacts on the affected system(s) or party(ies)</td>
<td>Slightly beneficial to the affected system(s) and party(ies)</td>
</tr>
<tr>
<td>Moderate</td>
<td>Moderate impacts on the affected system(s) or party(ies)</td>
<td>Moderately beneficial to the affected system(s) and party(ies)</td>
</tr>
<tr>
<td>Severe/Beneficial</td>
<td>Severe impacts on the affected system(s) or party(ies)</td>
<td>A substantial benefit to the affected system(s) and party(ies)</td>
</tr>
<tr>
<td>Very Severe/Beneficial</td>
<td>Very severe change to the affected system(s) or party(ies)</td>
<td>A very substantial benefit to the affected system(s) and party(ies)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unlikely</td>
<td>The likelihood of these impacts occurring is slight</td>
</tr>
<tr>
<td>May Occur</td>
<td>The likelihood of these impacts occurring is possible</td>
</tr>
<tr>
<td>Probable</td>
<td>The likelihood of these impacts occurring is probable</td>
</tr>
<tr>
<td>Definite</td>
<td>The likelihood is that this impact will definitely occur</td>
</tr>
</tbody>
</table>
* In certain cases it may not be possible to determine the severity of an impact thus it may be determined: Don't know/Can't know

Table 6.2a. Matrix used to determine the overall significance of the impact based on the likelihood and effect of the impact.

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 4 5 6 7 8 9 10 11 12 13 14 15 16</td>
</tr>
<tr>
<td>1</td>
<td>4 5 6 7 8 9 10 11 12 13 14 15 16 17</td>
</tr>
<tr>
<td>2</td>
<td>5 6 7 8 9 10 11 12 13 14 15 16 17 18</td>
</tr>
<tr>
<td>3</td>
<td>6 7 8 9 10 11 12 13 14 15 16 17 18 19</td>
</tr>
<tr>
<td>4</td>
<td>7 8 9 10 11 12 13 14 15 16 17 18 19 20</td>
</tr>
</tbody>
</table>

Table 2.2b. Description of Environmental Significance Ratings and associated range of scores

<table>
<thead>
<tr>
<th>Significance Rate</th>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>An acceptable impact for which mitigation is desirable but not essential. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in either positive or negative medium to short term effects on the social and/or natural environment.</td>
<td>4-8</td>
</tr>
<tr>
<td>Moderate</td>
<td>An important impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in either a positive or negative medium to long-term effect on the social and/or natural environment.</td>
<td>9-12</td>
</tr>
<tr>
<td>High</td>
<td>A serious impact, if not mitigated, may prevent the implementation of the project (if it is a negative impact). These impacts would be considered by society as constituting a major and usually a long-term change to the (natural &amp;/or social) environment and result in severe effects or beneficial effects.</td>
<td>13-16</td>
</tr>
<tr>
<td>Very High</td>
<td>A very serious impact which, if negative, may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are unmitigable and usually result in very severe effects, or very beneficial effects.</td>
<td>17-20</td>
</tr>
</tbody>
</table>

The environmental significance scale is an attempt to evaluate the importance of a particular impact. This evaluation needs to be undertaken in the relevant context, as an impact can either be ecological or social, or both. The evaluation of the significance of an impact relies heavily on the values of the person making the judgment. For this reason, impacts of especially a social nature need to reflect the values of the affected society.

Prioritising
The evaluation of the impacts, as described above is used to prioritise which impacts require mitigation measures.

Negative impacts that are ranked as being of “VERY HIGH” and “HIGH” significance will be investigated further to determine how the impact can be minimised or what alternative activities or mitigation measures can be implemented. These impacts may also assist decision makers i.e. lots of HIGH negative impacts may bring about a negative decision.

For impacts identified as having a negative impact of “MODERATE” significance, it is standard practice to investigate alternate activities and/or mitigation measures. The most effective and practical mitigations measures will then be proposed.
For impacts ranked as “LOW” significance, no investigations or alternatives will be considered. Possible management measures will be investigated to ensure that the impacts remain of low significance.

6.4 Impact Assessment

The impacts identified in Section 6.2 are assessed in terms of the criteria described in Section 6.3 and are summarised below.

The following impacts are likely to occur during the Construction Phase of the proposed Dassiesridge WEF:

6.4.1 IMPACT 1: Management of hazardous chemicals

Cause and comment:
Soil contamination may occur as a result of hazardous chemical spills that will further result in a loss of fertile soils.

Significance Statement:
Impacts associated with soil contamination from spill during the construction phase are probable. The extent of the impacts is likely to be limited to the study area in the short term. Without mitigation the impacts will probably occur and should be regarded as moderate. The overall significance of the impact will be reduced through mitigation.

<table>
<thead>
<tr>
<th>Impact 1.</th>
<th>Effect</th>
<th>Risk or Likelihood</th>
<th>Overall Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Issue 1.1: Loss of fertile soils from hazardous spill contamination</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without Mitigation</td>
<td>Long Term</td>
<td>Localised</td>
<td>Severe</td>
</tr>
<tr>
<td>With Mitigation</td>
<td>Long Term</td>
<td>Localised</td>
<td>Slight</td>
</tr>
</tbody>
</table>

Impact Mitigation:
- Machinery must be properly maintained to keep oil leaks in check.
- If a spill occurs on a permeable surface (e.g. Soil), a spill kit must be used to immediately reduce the potential spread of the spill.
- If a spill occurs on an impermeable surface such as cement or concrete, the surface spill must be contained using oil absorbent materials.
- Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of hazardous chemicals to the environment, and stored in adequate containers until appropriate disposal in a licenced landfill site.

6.4.2 IMPACT 2: Increased risk of fires from construction activities.

Cause and comment:
An increase in construction activity onsite (especially activities like welding and grinding) will result in the potential increase of fire risk in the area. Bush fires are a big contributor to the loss of grazing land and game livestock.

Significance Statement:
Impacts associated with fire risk during the construction phase are probable if not mitigated and should be regarded as high. The extent of the impacts is likely to spread to the entire study area. The overall significance of the impact will be reduced through mitigation.

Impact 2. | Effect | |
|-----------|--------|
### Issue 2.1: Fires risk increase caused by construction activities

<table>
<thead>
<tr>
<th></th>
<th>Temporal Scale</th>
<th>Spatial Scale</th>
<th>Severity of Impact</th>
<th>Risk Likelihood</th>
<th>Overall Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without Mitigation</td>
<td>Short Term</td>
<td>Study Area</td>
<td>Very severe</td>
<td>Probable</td>
<td>HIGH</td>
</tr>
<tr>
<td>With Mitigation</td>
<td>Short Term</td>
<td>Localised</td>
<td>Slight</td>
<td>Unlikely</td>
<td>LOW</td>
</tr>
</tbody>
</table>

**Impact Mitigation:**
- Ensure that all personnel are aware of the fire risk and the need to extinguish cigarettes before disposal, in appropriate waste disposal containers.
- Smoking will only be allowed in demarcated areas with easy access to firefighting equipment.
- Welding and other construction activities requiring open flames shall be done in a designated area containing firefighting equipment.
- The risk of fire is highest in the late summer and autumn months, during high wind velocities and dry periods. To avoid and manage fire risk the following steps should be implemented:
  - Have on site fire-fighting equipment and ensure that all personnel are educated how to use it and procedures to be followed in the event of a fire.
  - Identify the relevant authorities and structures responsible for fighting fires in the area and shall liaise with them regarding procedures should a fire commence.
  - Ensure that all the necessary telephone numbers etc. are posted at conspicuous and relevant locations in the event of an emergency.
- No open fires shall be allowed on site for the purpose of cooking or warmth. Cooking fires must only be lit in designated cooking areas.
- The contractor shall take all reasonable steps to prevent the accidental occurrence or spread of fire.
- The contractor shall appoint a fire officer who shall be responsible for ensuring immediate and appropriate action in the event of a fire.
- The contractor shall ensure that all site personnel are aware of the procedure to be followed in the event of a fire. The appointed fire officer shall notify the Fire and Emergency Services in the event of a fire and shall not delay doing so until such time as the fire is beyond his / her control.
- The contractor shall ensure that there is basic fire-fighting equipment on site at all times. This equipment shall include fire extinguishers and beaters.
- Any work that requires the use of fire may only take place within designated areas. Fire-fighting equipment shall be available in these areas.
- The contractor shall ensure that the correct emergency call numbers for the nearest fire department and the local Farmers Association Fire Marshall are easily accessible at all times, and that in the event that a fire becomes unmanageable, these people are notified as a matter of urgency.

6.4.3 **IMPACT 3: Soil stockpiling management**

**Cause and comment:**
Incorrect stockpiling methods of soil will result in a decrease of agricultural viability/potential of these soils and may even cause sterilization of these soils due to a decrease in viable seedbank.

**Significance Statement:**
Impacts associated with soil stockpiles during construction are considered as short term impacts taking place on a small localised area. The overall significance of the impact without mitigation would be LOW NEGATIVE even without mitigation measures.
**Impact Mitigation:**

- Develop and implement a Rehabilitation and Monitoring Plan to monitor stockpiles.
- Ensure that topsoil does not get buried by subsoil during stockpiling. Failure to comply will result in topsoil sterilisation.
- Implement measures such as wind-breaks, swales and watering as required to ensure no wind or stormwater erosion occurs.
- Fertile topsoil must not be stockpiled for periods exceeding 12 months or exceeding 2m in height.

### 6.4.4 IMPACT 4: Soil profile disturbance and resultant decrease in soil agricultural capability

**Cause and comment:**

Excavations for the construction of the turbines and associated infrastructure will disturb the soil profile. If topsoil becomes buried, or subsoil and rock that is less suitable for root growth, remains at the surface, the agricultural suitability of the soil, that will become available for agriculture again after decommissioning of the WEF, will be reduced.

**Significance Statement:**

Impacts associated with the disruption of fauna from increased noise during the construction phase is probable. The extent of the impacts are likely to be limited to the study area in the short term. Without mitigation the impacts will definitely occur and should probably be regarded as moderate. The overall significance of the impact without mitigation would be LOW NEGATIVE even without mitigation measures.

### Impact Mitigation:

- The upper 30cm of top soil must be stripped and stockpiled as topsoil. It should be retained for re-spreading over disturbed surfaces during rehabilitation.
- All other soil excavated will be stockpiled separately from topsoil as subsoil.
- Ensure that topsoil does not get buried by subsoil during backfilling. Failure to comply will result in topsoil sterilisation.
- An ECO must monitor all excavations to ensure backfilling with subsoil first and then topsoil afterwards takes place.
- An ECO must monitor depth and cover of topsoil spreading during rehabilitation to ensure a 30cm depth.
- Topsoil allocated for rehabilitation must not be mixed with other materials, such as building rubble, rock, subsoil, etc.
- Topsoil stockpiles are to be handled only twice – once during clearing and stockpiling and once during rehabilitation/backfilling.
The following impacts are likely to occur during the Operational Phase of the proposed Dassiesridge WEF:

6.4.5 IMPACT 5: Increase in erosion potential

Cause and comment:
An increase in hard surfaces (concrete foundations and roads) will increase stormwater run-off and potentially lead to an increase in soil erosion.

Significance Statement:
Impacts associated erosion from increased stormwater run-off during the operational phase is definite over the next 20 years. The extent of the impact is likely to be limited to the study area but may be severe. The overall significance of the impact will be reduced from high negative to low negative after mitigation.

<table>
<thead>
<tr>
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<th>Risk or Likelihood</th>
<th>Overall Significance</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Temporal Scale</td>
<td>Spatial Scale</td>
<td>Severity of Impact</td>
</tr>
<tr>
<td>Issue 5.1: Increase in soil erosion due to an increase in stormwater runoff</td>
<td>Without Mitigation</td>
<td>Long Term</td>
<td>Study Area</td>
</tr>
<tr>
<td>With Mitigation</td>
<td>Long Term</td>
<td>Study Area</td>
<td>Slight</td>
</tr>
</tbody>
</table>

Impact Mitigation:
- All run-off water must be collected, channelled and disposed of in an appropriate manner.
- Anti-erosion features must be installed where required.
- Ensure that all cleared and impacted land is rehabilitated and re-vegetated.

6.4.6 IMPACT 6: Establishment of renewable energy infrastructure on agricultural land

Cause and comment:
Loss of up to 35 ha of moderate to low potential agricultural land as a result of new WEF infrastructure development.

Significance Statement:
Loss of land currently utilised as agricultural land is definite. The extent of the impact is likely to occur over a long period (20 years) but will be localised to the immediate study area. Mitigation will not change the overall significance of the impact but will reduce the cumulative impact.

<table>
<thead>
<tr>
<th>Impact 6.</th>
<th>Effect</th>
<th>Risk or Likelihood</th>
<th>Overall Significance</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Temporal Scale</td>
<td>Spatial Scale</td>
<td>Severity of Impact</td>
</tr>
<tr>
<td>Issue 6.1: Loss of agricultural land due to the development of a WEF onsite</td>
<td>Without Mitigation</td>
<td>Long Term</td>
<td>Localised</td>
</tr>
<tr>
<td>With Mitigation</td>
<td>Long Term</td>
<td>Localised</td>
<td>Slight</td>
</tr>
</tbody>
</table>

Impact Mitigation:
- Do not fence off any WEF infrastructure. This will allow maximum grazing and movement of game within the site.
**Impact 5.**

<table>
<thead>
<tr>
<th>Effect</th>
<th>Risk or Likelihood</th>
<th>Overall Significance</th>
</tr>
</thead>
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<tr>
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<td>Spatial Scale</td>
<td>Severity of Impact</td>
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<td>Without Mitigation</td>
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<td>Regional</td>
</tr>
<tr>
<td>With Mitigation</td>
<td>Long Term</td>
<td>Regional</td>
</tr>
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</table>

**Issue 5.2: Gradual reduction of available agricultural land as a consequence of an increase in renewable energy development in the local area.**

**Impact Mitigation:**

- Avoid developing on moderate potential agricultural land.
- If unavoidable, ensure that all development footprints are kept at a minimum.
Dassiesridge Wind Power is proposing to construct and operate a WEF to be developed between the towns of Uitenhage and Kirkwood in The Eastern Cape Province. The proposed Dassiesridge WEF will consist of up to 60 turbines each capable of generating approximately 3.3 MW of power depending on the model and size of turbine selected. The facility will have a maximum generating output of up to 183 MW, but the final design will be for a total capacity of 140 MW.

An agricultural and soil impact assessment was commissioned in order to predict and assess the significance of identified impacts associated with the proposed activity on the agricultural potential of the affected land.

The proposed development’s primary impact on agricultural activities will involve the construction of the wind turbines and associated infrastructure (access roads and cables). The construction of these turbines and associated infrastructure will only influence an area of around 3 ha of the total local agricultural portion.

It is expected that the entire site will be reverted back to agricultural land during decommissioning of the Dassiesridge WEF site.

The No-Go alternative would mean abandoning the proposed development and as such there will be no negative impact on the environment as identified in Section 6. Furthermore it may also result in none of the positive impacts of renewable energy in terms of climate change mitigation being realised from this area.

The construction entails the clearing of vegetation within the proposed footprint of the wind turbine, as well as creating service roads and laydown areas. Grazing may be permitted around and underneath the wind turbines while crop fields may be grown around the turbine sites (if so required). The impact of the proposed Dassiesridge WEF development on the study area’s agricultural potential will be low, with the loss of agricultural land mostly being attributed to the creation of the service roads, wind turbine foundations and a laydown area. The total loss of grazing land will be less than 1 % of the total estimated agricultural area of 15 000 ha.

7.1 Recommendations for the proposed Dassiesridge WEF

Alternative A1 are considered as the preferred powerline alternative. This consideration is based on the fact that alternative A1 will have the smallest impact on soils and agricultural land. None of the other powerline alternatives (A2, A3, A4) are considered as “fatally flawed”.

All the mitigation measures provided below are to be implemented in the Construction and Operation Phases of the proposed Dassiesridge WEF.

7.1.1 Planning and Design

- Develop and implement a Rehabilitation and Monitoring Plan to monitor stockpiles.
- Anti-erosion features must be installed where required.
- Avoid developing on moderate potential agricultural land.

7.1.2 Construction

- Machinery must be properly maintained to keep oil leaks in check.
- If a spill occurs on a permeable surface (e.g. Soil), a spill kit must be used to immediately reduce the potential spread of the spill.
- If a spill occurs on an impermeable surface such as cement or concrete, the surface spill must be contained using oil absorbent materials.
• Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of hazardous chemicals to the environment, and stored in adequate containers until appropriate disposal in a licenced landfill site.

• Ensure that all personnel are aware of the fire risk and the need to extinguish cigarettes before disposal, in appropriate waste disposal containers.

• Smoking will only be allowed in demarcated areas with easy access to firefighting equipment.

• Welding and other construction activities requiring open flames shall be done in a designated area containing firefighting equipment.

• The risk of fire is highest in the late summer and autumn months, during high wind velocities and dry periods. To avoid and manage fire risk the following steps should be implemented:
  o Have on site fire-fighting equipment and ensure that all personnel are educated how to use it and procedures to be followed in the event of a fire.
  o Identify the relevant authorities and structures responsible for fighting fires in the area and shall liaise with them regarding procedures should a fire commence.
  o Ensure that all the necessary telephone numbers etc. are posted at conspicuous and relevant locations in the event of an emergency.
  o No open fires shall be allowed on site for the purpose of cooking or warmth. Cooking fires must only be lit in designated cooking areas.

• The contractor shall take all reasonable steps to prevent the accidental occurrence or spread of fire.

• The contractor shall appoint a fire officer who shall be responsible for ensuring immediate and appropriate action in the event of a fire.

• The contractor shall ensure that all site personnel are aware of the procedure to be followed in the event of a fire. The appointed fire officer shall notify the Fire and Emergency Services in the event of a fire and shall not delay doing so until such time as the fire is beyond his / her control.

• The contractor shall ensure that there is basic fire-fighting equipment on site at all times. This equipment shall include fire extinguishers and beaters.

• Any work that requires the use of fire may only take place within designated areas. Fire-fighting equipment shall be available in these areas.

• The contractor shall ensure that the correct emergency call numbers for the nearest fire department and the local Farmers Association Fire Marshall are easily accessible at all times, and that in the event that a fire becomes unmanageable, these people are notified as a matter of urgency.

• Ensure that topsoil does not get buried by subsoil during stockpiling. Failure to comply will result in topsoil sterilisation.

• Implement measures such as wind-breaks, swales and watering as required to ensure no wind or stormwater erosion occurs.

• Fertile topsoil must not be stockpiled for periods exceeding 12 months or exceeding 2m in height.

• The upper 30cm of top soil must be stripped and stockpiled as topsoil. It should be retained for re-spreading over disturbed surfaces during rehabilitation.

• All other soil excavated will be stockpiled separately from topsoil as subsoil.

• Ensure that topsoil does not get buried by subsoil during backfilling. Failure to comply will result in topsoil sterilisation.

• An ECO must monitor all excavations to ensure backfilling with subsoil first and then topsoil afterwards takes place.

• An ECO must monitor depth and cover of topsoil spreading during rehabilitation to ensure a 30cm depth.

• Topsoil allocated for rehabilitation must not be mixed with other materials, such as building rubble, rock, subsoil, etc.

• Topsoil stockpiles are to be handled only twice – once during clearing and stockpiling and once during rehabilitation/backfilling.

7.1.3 Operation

• All run-off water must be collected, channelled and disposed of in an appropriate manner.

• Ensure that all cleared and impacted land is rehabilitated and re-vegetated.
- Do not fence off any WEF infrastructure. This will allow maximum grazing and movement of game within the site.
- If unavoidable, ensure that all development footprints are kept at a minimum.

### 7.2 Agricultural statement and Opinion of the Specialist

The agricultural impacts of all the aspects of the proposed Dassiesridge WEF were considered and deemed to be acceptable, provided that the mitigation measures provided in this report are implemented.

Although limited agricultural output (game only) within the affected area will be impacted by the proposed development, no problematic areas or fatal flaws were identified for the site.

Although powerline alternatives A1 & A2 are much shorter routed lines compared to powerline alternatives A3 & A4, the latter will follow existing powerline routes. There were no other significant impact identified on agriculture and soils other than the size of the footprints of the different powerline alternative options. Therefore all 4 options are considered as acceptable. Alternative A1 are considered as the preferred powerline alternative. This consideration is based on the fact that alternative A1 will have the smallest impact on soils and agricultural land.

All the identified impacts on agriculture are considered to have high reversibility because the land will be able to be returned to agriculture after closure, with very little change in agricultural potential. Impacts on agriculture are also considered to have low irrereplaceability of resource loss because:

1. of the small area of land involved,
2. low suitability for crops
3. it is highly unlikely to be irreplaceably lost to agriculture.

### REFERENCES


National Environmental Management Act (No 107 of 1998) as amended in 2010

National Water Act (No 36 of 1998)


APPENDIX A

SOIL LABORATORY RESULTS
### Agricultural and Soil Assessment – October 2014

**BROOKSIDE LABORATORIES, INC.**

**SOIL AUDIT AND INVENTORY REPORT**

<table>
<thead>
<tr>
<th>Name</th>
<th>De Kock Roy</th>
<th>City</th>
<th>Heidelberg</th>
<th>State</th>
<th>GP</th>
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<tbody>
<tr>
<td>Independent Consultant</td>
<td>Vermi Solutions</td>
<td>Date</td>
<td>08/27/2014</td>
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<th>DASSIESRIDGE</th>
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<td>7.1</td>
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#### SOLUBLE SULFUR*

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<tbody>
<tr>
<td>NEILHICH III</td>
<td>kg/ha</td>
</tr>
<tr>
<td>BRAY II</td>
<td>kg/ha</td>
</tr>
<tr>
<td>OLSEN</td>
<td>kg/ha</td>
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#### ANIONS

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#### EXCHANGEABLE CATIONS

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<tr>
<td>NEILHICH III</td>
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<td>kg/ha</td>
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<td>OLSEN</td>
<td>kg/ha</td>
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#### BASE SATURATION PERCENT

<table>
<thead>
<tr>
<th>Calcium</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnesium</td>
<td>%</td>
</tr>
<tr>
<td>Potassium</td>
<td>%</td>
</tr>
<tr>
<td>Sodium</td>
<td>%</td>
</tr>
<tr>
<td>Aluminum</td>
<td>%</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>%</td>
</tr>
</tbody>
</table>

#### EXTRACTABLE MINORS

| Boron* (ppm) | 0.66 |
| Iron* (ppm) | 0.70 |
| Manganese* (ppm) | 1.23 |
| Copper* (ppm) | 1.81 |
| Zinc* (ppm) | 2.61 |

#### OTHER TESTS

| Soluble Salts (mmhos/cm) | 638 |
| Chlorides (ppm) | 264 |
| NO<sub>3</sub>-N (ppm) | 4.5 |
| NH<sub>4</sub>-N (ppm) | 1.4 |
| Total Acidity (ME/100 g) | 0.458 |

* Mehlich III Extractable

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EOH Coastal & Environmental Services

Dassiesridge WEF
## Agricultural and Soil Assessment – October 2014

**BROOKSIDE LABORATORIES, INC.**

**SOIL AUDIT AND INVENTORY REPORT**

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| Organic Matter (humus) % | 8.95 | 1.61 |

### ANIONS

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<tr>
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<tr>
<td>MEHILCH III kg/ha P as P2O5 ppm d P</td>
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<td>46</td>
</tr>
<tr>
<td>BRAY II kg/ha P as P2O5 ppm d P</td>
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<td>26</td>
</tr>
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<td>Olsen kg/ha P as P2O5 ppm d P</td>
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<td>5</td>
</tr>
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### PHOSPHORUS

<table>
<thead>
<tr>
<th>CALCIUM* kg/ha ppm</th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>MAGNESIUM* kg/ha ppm</td>
<td>694</td>
<td>493</td>
</tr>
<tr>
<td>POTASSIUM* kg/ha ppm</td>
<td>444</td>
<td>762</td>
</tr>
<tr>
<td>SODIUM* kg/ha ppm</td>
<td>198</td>
<td>240</td>
</tr>
</tbody>
</table>

### BASE SATURATION PERCENT

- Calcium % | 95.01 | 84.40 |
- Magnesium % | 4.00 | 6.98 |
- Potassium % | 0.79 | 3.32 |
- Sodium % | 0.20 | 5.20 |
- Aluminum % | 0.00 | 0.00 |
- Hydrogen % | 0.00 | 0.00 |

### EXTRACTABLE MINORS

- Boron (ppm) | 2.82 | 1.86 |
- Iron (ppm) | 19 | 21 |
- Manganese* (ppm) | 28 | 58 |
- Copper* (ppm) | 1.25 | 1.79 |
- Zinc (ppm) | 2.77 | 1.45 |
- Aluminum* (ppm) | 24 | 267 |

### OTHER TESTS

- Soluble Salts (mhos/cm) |  |
- Chlorides (ppm) |  |
- NO3-N (ppm) | 8.4 | 4.9 |
- NH4-N (ppm) | < 0.5 | 0.9 |
- Total Acidity (ME/100 g) | 0 | 0 |

* Mehlich III Extractable

EOH
Coastal & Environmental Services
Dassiesridge WEF

a - alkaline soil