DESCRIPTION OF THE AFFECTED ENVIRONMENT CHAPTER 6

This section of the Final Scoping Report provides a description of the environment that may be affected by the proposed Wind Energy Facility on the West Coast of the Western Cape Province. This information is provided in order to assist the reader in understanding the possible effects of the proposed project on the environment. Aspects of the biophysical, social and economic environment that could directly or indirectly be affected by, or could affect, the proposed development have been described. This information has been sourced from both existing information available for the area as well as collected field data, and aims to provide the context within which this EIA is being conducted. A more detailed description of each aspect of the affected environment is included within the specialist scoping reports contained within Appendices L - X.

6.1. Location of the Study Area

The proposed wind energy facility is located in the West Coast District Municipality (WCDM) of the Western Cape Province. The WCDM is bordered by the Northern Cape Province to the north, and the Cape Metro and Cape Winelands Districts to the south and south-east. The western border is formed by the Atlantic Ocean, which forms the basis of the district's large and established fishing sector. The district includes five local municipalities, namely Matzikama, Cederberg, Bergriver, Saldanha Bay and Swartland, as well as four District Management Areas (DMAs) (refer to Figure 6.1).

In terms of its specific location, the study site falls on the boundary between the DMA of Western Cape Municipal Area 1 (WCMA01) and the Matzikama Local Municipality – that is, the northern portion of the site falls within the within the WCMA01, and the southern section of the site falls within the Matzikama Local Municipality (LM) area. Vredendal, the largest town in the region, is located approximately 60 km east of the site.

The demarcated study site (an area of approximately 35 km^2) comprises the following farms:

» Portion 5 of the farm Gravewaterkop 158 (known as Skaapvlei)
» A portion of Portion 620 of the farm Olifants River Settlement
» A portion of Portion 617 of the farm Olifants River Settlement

Figure 6.1: West Coast District Municipality

The western perimeter of the study area is 2 km inland from the coastline (i.e. the high-water mark). The West Coast is characterised by a flat to gently rolling terrain. The terrain lies between 60 m - 110 m above mean sea level. Large portions of the site have been transformed by dry land agriculture and sheep grazing. The natural vegetation is mainly Namaqualand Strandveld and Namaqualand Sand Fynbos.

6.2. Climatic Conditions

The West Coast area is characterised by a semi-arid Mediterranean climate with maximum temperatures ranging from 20°C – 30°C, depending on the season. The climate is strongly influenced by the cold Benguela current and coastal berg wind conditions. Rainfall is between 100 mm to 300 mm per annum, with the majority of the precipitation occurring during the winter months.

The prevailing winds are predominantly from the south east during summer and from the north west during winter. The cold ocean and warmer land mass results in typical daily cycle of offshore breezes at night and onshore winds increasing in strength during the day.

There is a weather station at Vredendal and one at Brand-se-Baai (which is monitored by Namakwa Sands). Key climatic data for these weather stations is summarised in Table 6.1.

Table 6.1: Key climatic data for the region

Weather Station	Vredendal	Brand-Se-Baai	Eskom's De Punt
Period of record	1958 to 1980	1994 to 2004	2003 - 2007
Precipitation (mm)	144	147 (main rainfall months May to September)	Average humidity 80% (100% maximum less than 10% of the time)
Evaporation Symons Tank (mm) A Pan (mm)	 1748 2182	 Not measured Not measured (estimated 1750mm)	 Not measured Not measured
Temperature (^{o}C)	-	-8.3^{o}C to 46.3^{o}C Ave July minimum: 8.6^{o}C Ave Feb maximum 23.8^{o}C	Average 15°C (no freezing with maximum 35°C for less than 1% of the time)
Wind Direction Wind velocity (m/s)	NW 6.5	S, SW 4.4	S, SW 6.2

Other relevant measurements obtained from the Eskom meteorological station at De Punt include:

» Wind gust maximum 3 sec mean – 180 km/hr (50 m/s)
» Maximum wind speed 10 minute mean – 114 km/hr (40 m/s)
» Turbulence < 15% at 50 m.

Figure 6.2 illustrates that the predominant wind direction experienced on the West Coast based on four years worth of data gathered from the Eskom meteorological station at De Punt. This shows the predominant wind to be a S, SW wind as also seen in the Brand-se-Baai measurements given above (i.e. percent of time in a direction). This is, however, not the strongest wind (or wind with most energy) experienced in this area, but the SSW wind is experienced most frequently.

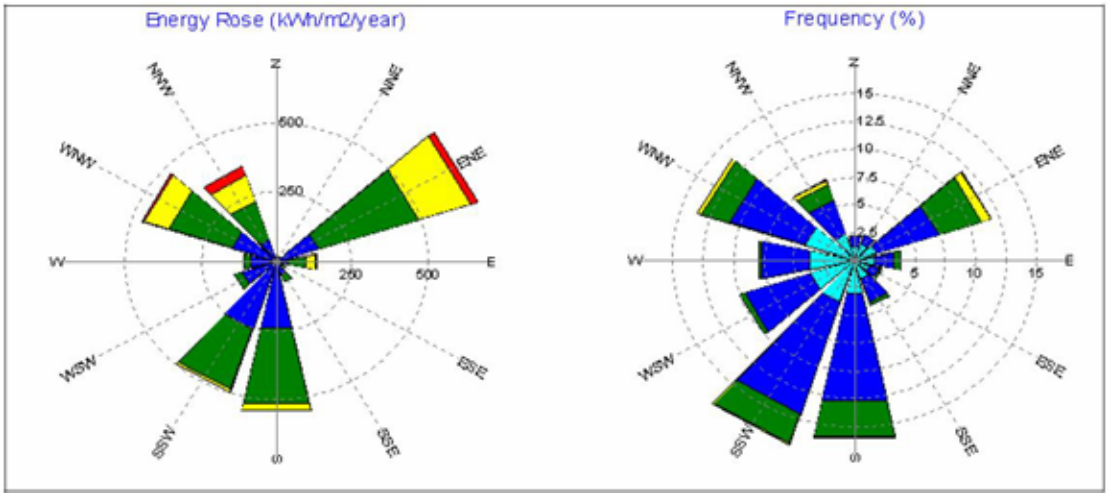

Figure 6.2: Wind Rose from measured data at the Eskom meteorological station at De Punt, indicating both wind energy as well as frequency of wind direction (% of time in a direction)

6.3. Regional Setting

The broader study area is an arid, sparsely populated area with less than 10 people per km^2 mostly concentrated within the small towns of the area. The Olifants River valley forms a distinct hydrological feature within the study area. It has to a large degree dictated the settlement patterns in this arid region by providing a source of perennial water for irrigated agriculture.

The Olifants River, with its associated irrigation canal systems, supports a flourishing agricultural sector within the LM that is largely linked to viticulture (i.e. the cultivation of grapes). Some of the products of the viticulture industry include table grapes, wines of export quality and raisins. Other crops produced include tomatoes, cucumbers, potatoes, sweet potatoes, onions, pumpkin and summer fruits such as watermelon and sweet melon.

The area generally has heavy mineral-bearing sediments which comprise a package of near-shore sands up to 24 million years old that have been deposited on the coastal plain. The heavy minerals which entered the system mixed with sediments were concentrated by coastal and beach processes and later by wind. A number of minerals are extracted and processed in the area. Of these, the diamond mining operations of TransHex at Die Punt, and the Namakwa Sands heavy minerals sand mining operations at Brand se Baai are the most extensive and significant. Other mining operations are current active on the farms Geelwal Karoo, Schaapvley Hills and Klipvlei Karoo Kop. The Detailed Composite WCSDF Spatial Plan indicates the land along the coast (a strip of 500 m – 1 km wide) as "mining". In the broader area, mining includes dolomite and limestone at Cape Quarries located just off the R362 to Klawer and marble at Industrial Minerals on the Karoo flats.

Archaeological sites, mainly shell middens, are known to be common close to the shoreline. These have, however, been disturbed extensively in some areas due to mining activity. It is understood from recent finds that parts of Namaqualand were occupied by people almost a million years ago, however the greatest amount of archaeological sites are those which relate to the ancestors of the San and Khoekhoen which have been radiocarbon dated to the last 5000 years. These sites are densest along the immediate coastline but may be found further inland close to water sources or natural foci (dunefields, rock outcrops) on the landscape. Colonial period sites, apart from those related to the relatively recent heritage of mining, are extremely scarce.

Large tracts of land within the study area are still in an untransformed state with varying degrees of degradation (predominantly as a result of sheep grazing). The predominant vegetation type or land cover, in terms of surface area, is described as Namaqualand Shrubland and Low Fynbos. These vegetation types are, due to the arid nature of this region, not very dense or tall in growth but rather scattered and low and represent a typical semi-desert environment. Riverine vegetation is found along the Olifants River but has, due to the cultivation of grapes and other crops, been altered to a large degree.

A number of communities are located in the Matzikama LM, the majority of which are located along the Olifants River. Of these, Vredendal and Strandfontein have been identified as having high development potential (the Western Cape Growth Potential of Towns Study, 2004). The other towns in the area that are considered to have tourist potential are Doringbaai, Koekenaap, Ebenhaeser, Klawer, Lutzville and Vanrhynsdorp. The type of tourist potential is, however, not clearly defined in the study.

Vredendal is the largest town and functions as the administrative centre of the Matzikama LM. Vredendal is an advanced town with well-developed infrastructure, including a modern aerodrome. Other significant settlements within a 50 km radius of the proposed site include Lutzville, Koekenaap, Ebenhaeser, Papendorp, Strandfontein and Doringbaai. Lutzville and Koekenaap are located on the Provincial road R363 approximately 25 km - 30 km inland from the coast. The economy of these towns is based on farming produce. Places of interest in this area include the Kliphuis Bushmen's Cave and Seal Island, a unique breeding location for seals a few hundred metres off the coastline.

In close proximity to Lutzville is the Sishen Saldanha railway bridge which crosses the Olifants River on the R363. This railway line is utilised by Sishen Mine to transport iron ore to Saldanha Bay for export.

The Matzikama Eco Park, which is currently being developed in this area, will encompass nature conservation, community development, research and economic sustainability.

Ebenhaeser is located on the southern bank of the Olifants River and approximately 10 km inland from the mouth of the river. This town is a historic Mission Station renowned for beautiful scenery and bird life. The small settlement of Papendorp (also known as Viswater) is situated on the Olifants River estuary, approximately 10 km downstream of Ebenhaeser near the mouth of the Olifants River. The Olifants River mouth and estuary is an extremely sensitive area in terms of birds, and has been recognised as an Important Bird Area (Barnes, 1998). It is one of only four perennial estuaries on the west coast, making it an extremely attractive haven for many coastal bird species. Approximately 125 bird species have been recorded there, most of which are water birds. Over 15 000 water birds occur regularly on the estuary. Residents of Papendorp derive their livelihood from fishing in the estuary, as well as from processing salt in the nearby salt pans. Locals are in the process of developing an eco-tourism resort with a guest house and camping area, including hiking trails and bird viewing points.

Strandfontein and Doringbaai are located on the coast, approximately 25 km to the south of the site. The town of Strandfontein is a favoured holiday destination and features luxury seaside accommodation and well-developed infrastructure. During the months of July to September, Strandfontein is visited for its wild flowers and the opportunity to view dolphins and whales. The town of Doringbaai is located approximately 8 km south of Strandfontein, and is characterised by the crayfish factory, jetty and lighthouse located within the bay. Other sites on the coast north of the Olifants River (and north of the study area) frequented by campers include Brand-se-Baai and Gert Du Toits-se-Baai.

The towns of Klawer and Vanrhynsdorp are also located within the Matzikama LM area. For travellers from the Northern Cape, Namibia and Gauteng, Vanrhynsdorp serves as an ideal entry point into the Western Cape and West Coast. It is the gateway to Namaqualand, Hantam-Karoo and the Cederberg. To the north of Vanrhynsdorp is the Knersvlakte, a vast undulating plain, covered with quartz pebbles and succulents. The Knersvlakte Biosphere Reserve area is currently being established, with the core area outside of the broader study area.

Vanrhynsdorp, the oldest town in Namaqualand, is known for its mild climate in winter, which allows for almost year-round outdoor recreational opportunities. Attractions include 4x4 adventures, birdwatching, mountain biking, rock climbing, paragliding, hiking and stargazing. Three botanical kingdoms converge here, namely the Nama Karoo vegetation, succulents in the Knersvlakte and Cape Fynbos in the mountains. Vanrhynsdorp is highlighted by the Western Cape

Provincial Government's Integrated Tourism Development Framework (ITDF) as a key node along the N7 route.

Klawer is situated on the banks of the Olifants River. Attractions of this town include river rafting in the nearby Doring River, and Khoi and Busmen rock art at various sites in the region's mountains. Agricultural activities include a variety of fruit and vegetables, which are exported to the international market.

The WCMA01 is also an arid, sparsely populated area that is predominantly rural. Unlike the Matzikama LM area, no major rivers occur in the area, and consequently its sparse population is scattered over large farms (mainly small stock-farming) and within a few settlements. Of these, Nuwerus, Bitterfontein and Rietpoort are of relevance to this study. These settlements fall within a radius of approximately 75 km of the proposed wind energy facility site, with Rietpoort at the extreme limit (more than 100 km by road). The WCMA01 is bisected by the N7 national road.

Nuwerus and Bitterfontein are located on the N7. Nuwerus is located approximately 70 km north of Vanrhynsdorp and originated as a staging post for mail coaches serving the vast northern interior before the west coast railway line was extended to Bitterfontein. About 20 km north of Nuwerus is the town of Bitterfontein, the terminus of the 465 km railway line from Cape Town. All the copper mined at Nababeep and Okiep as well as the granite blocks produced at the mine north of the town are railed from here.

Rietpoort is located just north of Bitterfontein. The name Rietpoort is a loose administrative term that is applied to a number of smaller settlements, which include Molsvlei, Put se Kloof and Stofkraal.

The WCMA01 does not possess any dedicated local municipal structures of its own, and the local authority functions are carried out by the WCDM based in Moorreesburg.

6.4. Social Characteristics of the Study Area and Surrounds

The study area is located in a predominantly natural to rural environment. Overall, the study area and surrounds are sparsely populated. The closest farm homesteads or residences that might potentially be impacted upon by the proposed wind energy facility are at Skaapvlei, Skilpadvlei and Nooitgedag (refer to Figure 6.3). Ambient noise levels recorded in this area are considered to be equal to the acceptable day- and night-time noise rating levels for a rural residential district.

6.4.1. Demographic Profile

The demographic overview presented in this section is based on data from the most recent national Census (2001). Data from the Socio-Economic Profile: West Coast District (2006) is also presented. More details in this regard are presented within the specialist Social Scoping Study contained within Appendix X.

Vredendal is the most significant urban settlement in the area and accounts for more than 32% of the total population of the Matzikama LM area. After Vredendal, Lutzville is the second most populous town, with an estimated 8.5% of the total population of the Matzikama LM area. Between 2001 and 2006 the population increased at an annual average growth rate of ~3.3%. This represents the highest growth rate in the West Coast District Municipality. Population growth is expected to slow down to an average annual rate of 2.5% between 2006 and 2010 (West Coast District, 2006).

The overwhelming majority of the population is Coloured, followed by White and Black Africans. The population breakdown in terms of gender is roughly equal, with ~50.5% of the total population female and ~49.5% male. Afrikaans is the dominant first language in the area, with approximately 95% being native speakers. IsiXhosa is the second most dominant, and English third.

Education rates of the population are low, with approximately 13% of the population over the age of 5 years never having received any schooling. A small percentage of the population has completed secondary schooling or obtained a tertiary qualification.

Figure 6.3: Study area showing demarcated area of the proposed wind energy facility in proximity to closest farm homesteads or residences which occur at Skaapvlei, Skilpadvlei and Nooitgedag

6.4.2. Economic Profile

The sub-regional economy in the area is traditionally based on primary sector activities such as agriculture, fishing and mining, both in terms of employment provision and economic throughput. The agriculture, forestry and fishing sectors

are the largest economic sectors in the Matzikama LM, with the agriculture and fisheries sectors providing only seasonal employment in the area. Of the mining activities in the area, the diamond mining operations of TransHex at Die Punt (Matzikama) and the Namakwa Sands heavy minerals sand mining operations at Brand se Baai (WCMA01) are the most significant, providing employment to a large number of people.

Although unemployment rates of between 10 and 14% (as reported from the 2001 Census data) appear to be low when compared to the estimated June 2006 national employment rate (26.5%), the actual seasonal unemployment rates may be significantly higher due to the seasonal nature of the demand for labour associated with the fruit and vegetable cropping operations along the Olifants River Valley. The unemployment rates out of season may, therefore, be significantly higher than the 2001 Census data indicates. In this regard a study undertaken for the WCDM in 2001 estimated that at least 50% of people employed in elementary work were effectively unemployed or underemployed. Significantly, the unemployment rate for the HD community of Aiville Park (Vredendal) was estimated at over 53%. In the Matzikama LM, females, Africans, young people and those with lower levels of formal education - especially those with incomplete secondary education - are highly affected by unemployment. Youth unemployment is particularly high, with 70 % of the unemployed being between the ages of 15 and 34 (West Coast District, 2006).

Based on the 2001 Census data, poverty rates in the area are considered to be high. Of the total number of households in the area, an estimated 30% - 38% had an income of R800 or less per month in 2001. Given the seasonal nature of the agriculture and fishing industry many of the people in the area do not have access to income throughout the year.

6.5. Biophysical Characteristics of the Study Area and Surrounds

6.5.1. Geographical Profile

Namaqualand is a relatively mild desert where extremes are tempered by its proximity to the cold, upwelled waters of the Benguela Current (Desmet & Cowling, 1999a). Most of the area receives a winter rainfall of less than 150 mm per annum (Cowling *et al*., 1999). This low rainfall is highly predictable and prolonged droughts are rare (Desmet & Cowling, 1999a). Along the coastal margin, the meagre rainfall is supplemented by highly predictable coastal fog and copious dew-falls are widespread. Temperatures are relatively mild throughout the year, especially along the coast, but high temperatures of up to 40ºC may occur during winter when hot, turbulent air known as 'berg winds' descends coastward from the high altitude plateau of southern Africa (Cowling *et al*., 1999).

The topography of the area surrounding the proposed development site is described as undulating plains with the coastline (or coastal forelands) to the west characterised by steep cliff faces. Two major river valleys occur within the region, these being the Olifants River south of the site and the Klein Goerap River approximately 40 km north of the site. Moving inland the terrain becomes more undulating and hilly, and is characterised by hills and low mountains east of the R363.

The proposed development site lies on the coastal ridge overlooking the Atlantic Ocean at a height of 60 m - 110 m above sea level and consists of virtually flat to slightly undulating topography, with slopes of less than 4% (Figure 6.4). The 100 m contour level occurs sub-parallel with the coastline at distances of between 6 and 10 km inland of the coastline. This high-ground slopes towards the coastal environment towards the 50 m contour level that bisects the study area footprint in the north-west (near the old Weskus Mynbou landing strip) and south (west of the Nooitgedacht farmstead). Surface erosion is expected to occur in association with the larger rainfall events.

Figure 6.4: Photograph at the proposed site looking west indicating the nature of the topography within the area

The region is characterised by a surface cover comprising primarily of red aeolian sand of Tertiary to Quaternary age, overlying granite and gneiss of the Namaqualand Metamorphic Complex. These unconsolidated to weakly consolidated sediments underlie almost the entire area of interest. These wind-blown sands frequently form low-relief, mobile bedforms that are blown over

underlying harder calcareous soils. The dunes are able to form up and down the slopes of hills and valleys to reveal micro "climbing falling" dune morphologies.

Vegetated relict dunes appear to cover most of the area north of the main gravel access road to Skaapvlei, which traverses the study area. A much smaller area is evident south of this road. Many of the more obvious linear elements within this relict dunefield are orientated in a north - south direction.

Numerous, round, enigmatic structures, approximately 20 m in diameter, are assumed to represent mounds created by Meerkats (*Suricata suricatta*) or Harvester Termites (*Microhodotermes viator*). No other significant landforms of biological origin are known to be present within the study area.

The soils reported to occur within the study area are generally deep and have a low agricultural potential. This low agricultural potential is due to a combination of:

» excessive drainage due to the sandy texture
» low fertility associated with the low clay content
» a susceptibility to wind erosion if exposed, caused by the fine to medium grade of sand. This may be especially prevalent in dune areas.

The low agricultural potential of the soil, coupled with the low rainfall in the area means that there is little potential for arable agriculture in the area and that the soils are suited for extensive grazing at best. The grazing capacity of the area is low, around 30 ha/large stock unit.

The closest significant regional drainage system to that of the proposed wind energy facility is the perennial Olifants River, which flows in a south-westerly directly into the sea about 25 km south-east of the study area. No drainage channels of any significance occur in the study area. A few minor (poorly developed) ephemeral drainage channels do, however, occur to the west of the study area (north of Geelwal) and north-west of the study area (north of Baai Vals). These ephemeral drainage channels have no influence on the surface drainage in the study area.

Borehole parameter information from the study area indicates that boreholes in the subregion are typically deep (~100 m), exhibit a substantial median depth to groundwater rest level (~60 m), and support a comparatively low median yield (~0.4 L/s). In addition, the groundwater chemistry information indicates a poor overall quality of groundwater in the subregion.

6.5.2. Ecological Profile

The study area falls within the Namaqualand coastal region of the Cape Floristic Region, and includes two biomes, i.e. the Fynbos biome, and the Succulent Karoo biome (Mucina & Rutherford 2006; refer Figure 6.5). The Succulent Karoo is the only arid region recognised as a world biodiversity hotspot (Mittermeier *et al*., 2000). Stretching along the Atlantic coast of Africa, from south-western South Africa into southern Namibia, this biodiversity hotspot covers 116 000 km^2 of semi-desert. It is one of the 25 richest and most threatened reservoirs of plant and animal life on Earth. The Succulent Karoo boasts the world's richest succulent flora, as well as high reptile and invertebrate diversity. Compared to other hotspots, the vegetation remains relatively intact, yet only 30 000 km^2 of the original vegetation remains in a relatively pristine state. Only 5.8% of the hotspot is formally conserved (Mucina & Rutherford, 2006). Nearly one-third of the floral species of the region is unique to the hotspot.

The site falls within the buffer area of the proposed Knersvlakte Biosphere Reserve, and is situated at least 30 km to the west of the 'core area'.

The soil patterns on the site, together with distance from the coast largely determine the vegetation patterns in the area, which is typical of these coastal vegetation types, as fire is not an ecosystem driver in these arid areas (De Villiers, *et al* 2005). Two vegetation types are present within the study area, namely Namaqualand Strandveld and Namaqualand Sand Fynbos. The point where they meet is not at all clear-cut in most cases (as is often the case with vegetation patterns), and they usually create a wide ecotonal (transitional) mosaic where they come together. This ecotonal mosaic is in effect a third, nameless vegetation type. A single large seasonal pan is located on a hardpan and clay area at the central low point of the site, and at least two much smaller pans are found in the northern area of the site.

Namaqualand Strandveld is an extremely widespread vegetation type, especially in the context of the Cape Floristic Region, of which it is a part. This vegetation type extends from the Doringbaai area, some 20 km south of the Olifants River mouth, up the west coast for about 300 km, to the Hondeklipbaai area, and is thus formally part of the Succulent Karoo biome. The vegetation type typically occurs in a band from 1 to 30 km inland, on deep sands, which are often grey, red, brown or orange. This vegetation type is regarded as Least Threatened vegetation type in terms of the National Spatial Biodiversity Assessment (NSBA; Rouget et al 2004), with 92% of its original extent still intact. Significant habitat losses within this vegetation type have occurred in the recent past as a result of various mining activities along the west coast. Furthermore, Namaqualand Strandveld is significantly under-conserved in formal conservation

areas, with less than 1% of the national target of 26% under some sort of conservation management, and it is thus vulnerable to future transformation.

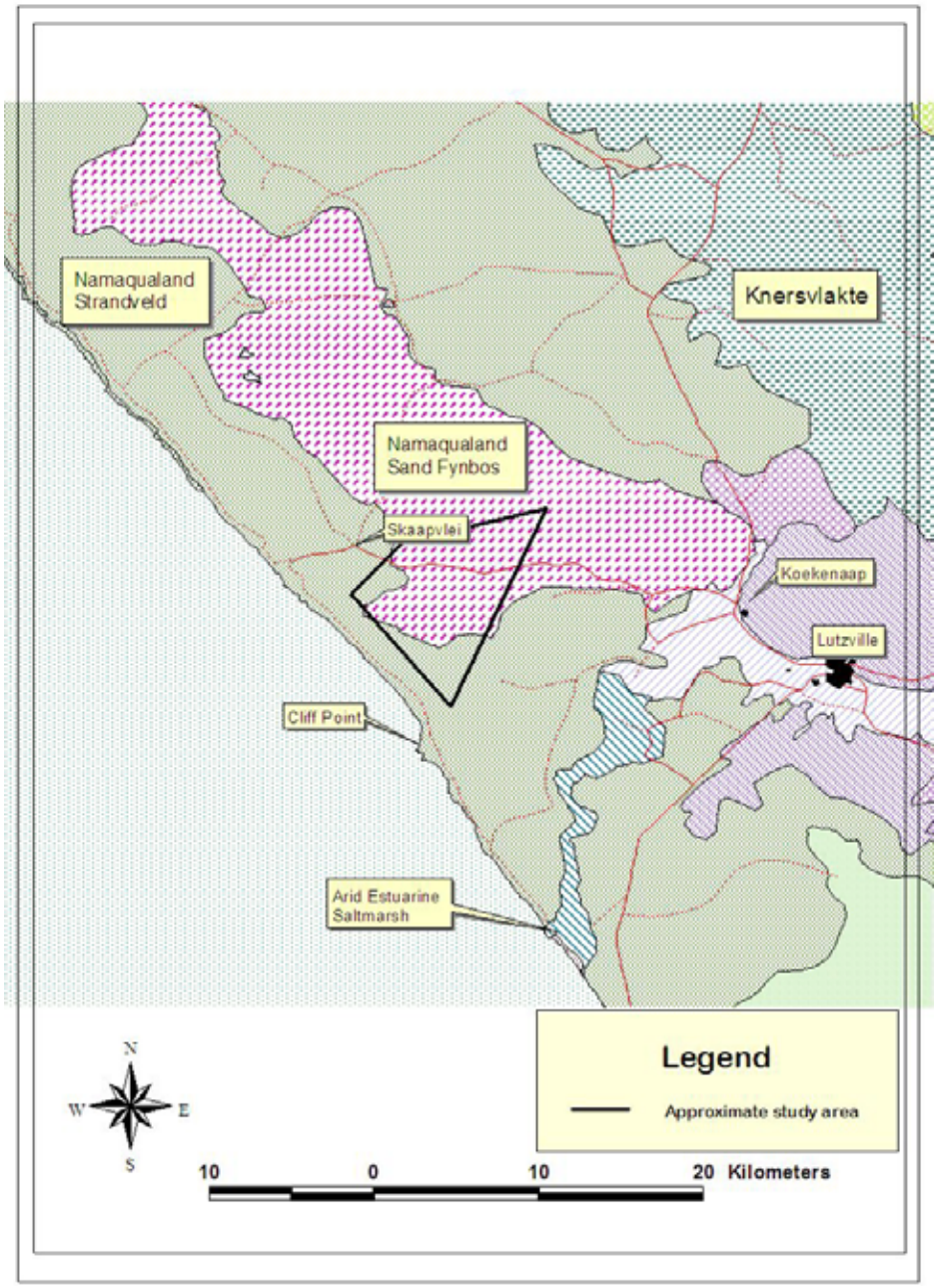

Figure 6.5: Extract from SA Vegetation map (Mucina & Rutherford 2006) showing that Namaqualand Strandveld and Namaqualand Sand Fynbos cover the site

There is significant variation within Namaqualand Strandveld in any one area, and it is possible to recognise a number of different forms or subtypes (plant communities), some of which are present in the study area.

Typical features of true Namaqualand Strandveld include a high percentage of succulents and leaf deciduous shrubs, moderate bulb diversity, and no Fynbos elements such as Ericaceae (heaths) and Proteaceae (proteas), with few Restionaceae (Cape reeds) (refer to Appendix L for more details in this regard).

Figure 6.6: Photograph showing typical tall Namaqualand Strandveld, showing dominant succulent perennials

Rare, range restricted and/or threatened plant species are also usually not a major feature of this vegetation type, although a specimen of *Leucoptera nodosa,* a rare succulent shrub in the daisy family generally known from the Strandveld between Hondeklipbaai and Lamberts Bay, was recorded in the study area. The species seems to occur as scattered individual plants on the study site, and is never common, but the population on site may be at least locally important. Five other potentially sensitive species were recorded on the site, namely *Lebeckia lotononoides*, a succulent species of shrubby *Trachyandra*, the vygie *Vanzijlia annulata*, the coastal endemic *Ferraria foliosa*, and *Hermannia* sp. nov, an undescribed 'new' species. There is a moderate possibility of other rare or localised plant species occurring on site and remaining undetected due to the large site and the seasonal constraints.

The **Namaqualand Sand Fynbos** within the study area is part of a much more extensive belt that can be seen in Figure 6.5, extending some 10 km to the east, 15 km southeast to the Doringbaai area (Helme, 2007), and over 200 km to the north. The vegetation type tends to occur on neutral to slightly acidic sands that are lighter in colour than Strandveld sands, and with a lower clay fraction. The

unit is also listed as a Least Threatened vegetation type by the NSBA, but it is equally poorly conserved, with only 1% of its 29% (of original extent) target formally conserved (Rouget *et al*., 2004). This is one of the few vegetation types within Namaqualand that is formally regarded as part of the Fynbos biome, and it is also very unusual in that it appears to be the only Fynbos vegetation type that regenerates in the absence of fire (Mucina & Rutherford 2006). Fires in such arid areas are extremely rare, and most landowners cannot remember their Fynbos areas ever having burnt. The primary threats to Namaqualand Sand Fynbos are climate change and mining for heavy mineral sands.

Figure 6.7: Sand Fynbos in the foreground on a dune ridge (note paler sands), with yellow flowered Strandveld elements (*Othonna cylindrica*). Taken from the north of the site looking south

True Namaqualand Sand Fynbos is characterised by the presence of particular specialist species (refer to Appendix K for more details in this regard). Very few of these species were recorded to be present in the Fynbos in the study area, which tends to be dominated by the less specialist species which are common in this vegetation type, and are restricted to Fynbos habitats, but in themselves are not diagnostic of pure Sand Fynbos. The potentially sensitive *Lebeckia lotononoides* was again recorded in this vegetation type. There is a Moderate likelihood of other undetected rare or range restricted species occurring in this habitat. The Red Data Listed proteoid *Leucospermum rodolentum* is not present.

Large parts of Portion 5 of Farm 158 have been cultivated using strip cultivation (refer to Figure 6.8), but significant natural rehabilitation has occurred in the strips since they were last cultivated twelve years ago.

The cultivated areas occur primarily on the Fynbos / Strandveld ecotone, although the unploughed strips indicate that the primary vegetation type is Strandveld. It is evident that both the ploughed and unploughed strips have been quite heavily grazed over many years, as a number of the more sensitive species have disappeared, and diversity is significantly lower here than in the nearby Strandveld areas where no strips are located.

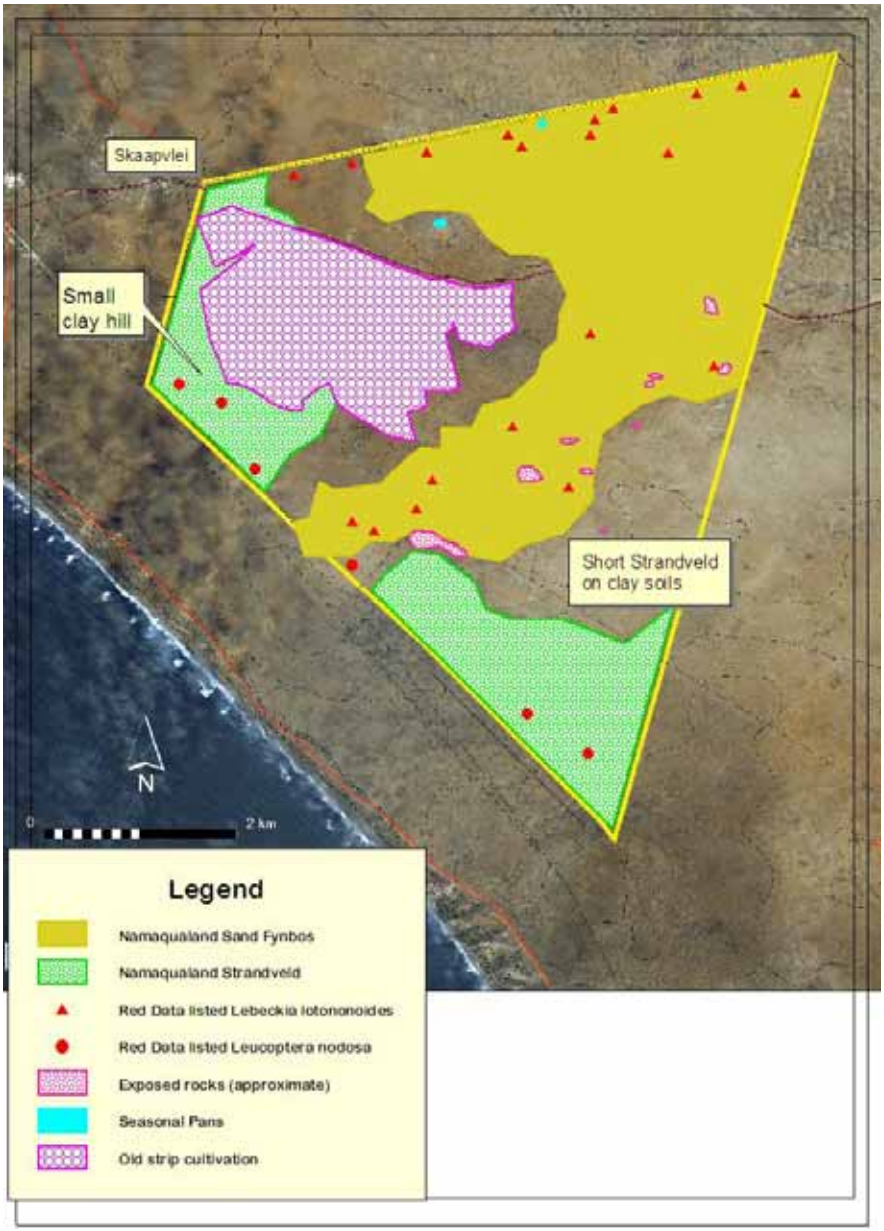

Figure 6.8: Satellite image of study area, showing key ecological & botanical features recorded. Unhatched areas within site are transitional mosaic areas with a mix of both Namaqualand Strandveld and Sand Fynbos. Red Data species' locations are approximate only.

There are only three seasonal pans on site (Figure 6.8), but only one of these (just north of the main road) is of any significant size (about 1 ha). The pans occur in a matrix of sandy soils, but are formed where the underlying clays come to the surface. The pans on this site do not appear to support any significantly different natural vegetation, which may be partly a result of disturbance in the form of heavy grazing.

The presence of faunal species is largely dictated by the habitat present on the site. Four main habitats suitable to terrestrial fauna were identified in the study area, i.e. coastal strip, rocky habitat, white coastal dunes, and inland Succulent Karoo (Namaqualand Sand Fynbos and Namaqualand Strandveld). The coastal strip is a mixture of alternating fine grain sandy beaches and rocky shoreline. At a few locations, rocks extend to well above the high water mark, constituting a distinct habitat for rock-dwelling animal species. The white coastal sand dunes include both vegetated and exposed ones. The inland areas feature low to moderate relief and short xeric Succulent Karoo vegetation on red aeolian sand.

The proposed site for the erection of the wind energy facility only offers one faunal habitat type, namely Succulent Karoo on red aeolian sand.

The insect fauna of the area is poorly known since the large number of species involved and the problem of seasonality imposes considerable limitations on insect surveys of short duration. The survey of Picker (1990) has not revealed the presence of any rare or threatened species of insect in the immediate vicinity of the Namakwa Sands mine site, which is approximately 30 km to the north of the study area.

Sixteen frog species occur in the broader area surrounding the study site (Minter *et al*., 2004). Of these only the Namaqua Rain Frog (*Breviceps namaquensis*) and the Namaqua Caco (*Cacosternum namaquense*) potentially occur within the study area. Neither of these species is listed as Red Data species. The Namaqua Rain Frog breeds terrestrially, i.e. there is no larval stage and no water body is required for breeding. The Namaqua Caco, on the other hand, needs at least a temporary water body for breeding. None of the three species potentially occurring in the study area are classified as Red Data species (Minter et al., 2004).

From available literature (Branch, 1998) and from previous sampling in the Namakwa Sands area at Brand-se-Baai (De Villiers, 1990; Mouton & Alblas, 2003), it is apparent that 44 reptile species may occur in the present smaller study area (refer to Appendix L for details). Nine of these species are listed as Red Data species (Baard et al., 1999), three being classified as Vulnerable (i.e. Lomi's Blind Legless Skink, Armadillo Girdled Lizard and the Namaqua Dwarf Adder), two are classified as Lower Risk (i.e. the Large-scaled Girdled Lizard and

the Namaqua Plated Lizard) and four are listed as Data Deficient (i.e. Cuvier's Blind Legless Skink, Austen's Thick-toed Gecko, the Rough Thick-toed Gecko, and the Speckled Padloper tortoise).

Rautenbach (1990) recorded 19 mammal species and confidently expects a further 16 species to occur in the Namakwa Sands mining area at Brand-se-Baai, 30 km to the north of the proposed site (refer to Appendix M for details). Most of these species are also expected to occur in the present study area as the habitat is very similar. The 35 species include six insectivores, four bats, two hare/rabbit species, 10 rodents, one felid, three canids, one mustelid, five viverrids, the dassie, and two antelope species. Only two of the 11 Red Data species occurring in the broader study area, may be present in the study area, namely Grant's Golden Mole and the Namaqua Dune Mole-rat.

At least four bat species are expected to frequent the study area (refer to Appendix M for details), none of which are of conservation importance (Friedmann and Daly, 2004).

The Succulent Karoo biome in general supports high numbers of endemic bird species, mostly ground living species of open habitats. Bird micro-habitats encountered in the study area include natural succulent Karoo shrubland, old agricultural lands (i.e. the cultivated areas located on large parts of Portion 5 of Farm 158), and pans (specifically the larger pan identified on the site. A total of eighteen Red Data bird species were recorded across the study area, six of which are classified as Vulnerable and twelve as Near-threatened (refer to Appendix N for details). Bird species that are likely to occur regularly on the proposed site itself include Ludwig's Bustard, African Marsh Harrier, Lesser Kestrel, Black Harrier, Karoo Lark and Secretarybird. Many of the remaining species are coastal species and are unlikely to frequent the study area.