



Environmental Impact Assessment for the Establishment of the Langhoogte Wind Farm, Western Cape Province

Environmental Impact Report

HERITAGE IMPACT ASSESSMENT

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DECLARATION OF INDEPENDENCE

We, Lita Webley & David Halkett as duly authorised representative of ACO Associates cc, hereby confirm our independence (as well as that of ACO Associates cc) as the heritage specialist for the Langhoogte Wind Farm and declare that neither we nor ACO Associates cc have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which Arcus GIBB was appointed as environmental assessment practitioner in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), other than fair remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act) for the Langhoogte Wind Farm. We further declare that we are confident in the results of the studies undertaken and conclusions drawn as a result of it. We have disclosed, to the environmental assessment practitioner, in writing, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act. We have further provided the environmental assessment practitioner with written access to all information at our disposal regarding the application, whether such information is favourable to the applicant or not. We are fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2010 and any other specific and relevant legislation (national and provincial), policies, guidelines and best practice.



Signature: _____

Full Name: Lita Webley & David Halkett

Title / Position: Principle Investigators: Heritage Impact Assessments

Qualification(s): PhD (Archaeology) & MA (Archaeology)

Experience (years/ months): 16 Years & 23 Years

Registration(s): Association of Southern African Professional Archaeologists

EXECUTIVE SUMMARY

ACO Associates was appointed by Gibb (Pty) Ltd, on behalf of the client SAGIT Energy Ventures, to conduct a Heritage Impact Assessment for the proposed construction of a wind energy facility of 112 - 162 MW, comprising 45 wind turbines along with supporting infrastructure, on several farms adjoining the N2 and R43 between Botrivier and Caledon in the Overberg, Western Cape. The electricity will feed via a proposed 132kV overhead powerline to the existing Houhoek sub-station via one of four alternative options.

The Notice of Intent to Develop was submitted to Heritage Western Cape and they have issued the following Interim Comment (14 July 2011): "An HIA is required consisting of an Archaeological Study, a Palaeontological Study, a Visual Study with an Integrated set of Recommendations".

The Palaeontological study was undertaken by John Almond of Natura Viva cc. The Archaeological study was undertaken by Lita Webley and David Halkett of ACO Associates cc. The Visual study was undertaken by Alan Cave of Bapela Cave Klapwijk cc (BCK).

This HIA integrates the findings of the Archaeological, Palaeontological and Visual studies. Although not specifically requested, it takes cognizance of the Built Environment. The Cultural Landscape and Scenic Routes are considered as part of the Visual Impact Assessment.

The closest registered Conservation Body to the proposed development is the Bot River Aesthetics Committee which is concerned with the Bot River Conservation area and the area adjoining it. The Committee did not make a formal presentation during the Public Participation Process. Two emails and three phone calls were made to the Committee. The Chairperson undertook to provide written input into the proposed development but this was not available at the time of completion of the report.

As a result of the HIA process, the following recommendations were made:

Palaeontology

- The effective paleontological sensitivity of the Table Mountain Group, Bokkeveld Group and younger sedimentary rocks in the study area is very low. There are no recommendations for specialist palaeontological mitigation or further studies for this project. It is recommended that the ECO responsible for the Langhoogte wind farm development should be alerted to the possibility of fossil remains during construction.

Archaeology

- Early Stone Age archaeological material is widespread in agricultural lands between Botrivier and Caledon and is generally considered of low significance. Middle and Later Stone Age sites were found on a little rocky hill behind De Vlei farmstead but they are not threatened by the development. A Later Stone Age lower grindstone was recovered from the edge of a ploughed land. No mitigation is required with respect to pre-colonial archaeology;
- No historical archaeological material was recovered. Generally, a historic archaeological signature is concentrated around farmsteads and their immediate environs. A buffer of 400m should be maintained around farmsteads to ensure that no buried historic material is destroyed. If any historical material is uncovered during the construction phase of the development it should be reported to Heritage Western Cape.

The overall impact significance of the proposed Langhoogte wind farm project on archaeological resources is consequently assessed as low (*negative*).

Built Environment and Graves

- The historic farmstead of Boontjieskraal, which is considered to be of potential Grade 2 significance by Heritage Western Cape, is located some 3.5km to the south-east of the closest turbine position outside the study area;
- The historic farmstead of Compagnies Drift (now known as Beaumont Estates) which is of Grade 3A significance is located 2.6km to the south-west of the closest turbine, outside the study area;
- There are farm graveyards on Langhoogte and Klipheuwel, near the farm buildings. No graveyards are threatened by the development. However, should human remains be uncovered during the construction of the wind farm, then work should stop and Heritage Western Cape should be notified;
- None of the farm houses in the study area are of historic significance. There are no buildings which will be demolished during the construction of the wind farm. A Buffer of 400m has been implemented around each farm complex. The mitigation of potential impact would involve the maintenance of buffers around farm buildings;

Cumulative Impact on palaeontology and archaeology

At least three other wind energy facilities have been proposed for the Botrivier – Caledon region, namely the Caledon WEF with 37 turbines, the Dassiesfontein WEF with 6 turbines and the Klipheuwel WEF with 10 turbines. The latter two wind farms have been handled as one application and EIA authorisation has been obtained. The Caledon WEF awaits EIA authorisation.

Since the bedrocks in this region are generally of low to very low palaeontological sensitivity, the cumulative impact of the proposed developments on fossil heritage is considered to be of low significance. Similarly, the cumulative impact of the proposed wind farm on the archaeological heritage is of low significance. The cumulative impact of the proposed wind farm on the visual

Powerline Alternatives

The electricity generated by the wind farm will be fed into the existing Houhoek sub-station at Bot River via a 132kV powerline, carried on a 24m high monopole. A Northern and Southern alternative have been proposed with three sub-routes for the southern alternative.

- The northern route crosses the Van der Stel Pass resulting in high visual impact and there are engineering complexities with crossing the N2 on the Houwhoek Pass;
- The Southern route (preferred route): is SAGIT's preferred route. Three possible sub-routes are proposed and assessed as alternatives. It is proposed to run as close as possible to the existing 66kV Eskom line. Eskom have confirmed that they will expand their current network distribution between the Houhoek substation and Caledon in the future and the expansion will take the form of a new double circuit 132kV line.

The impact significance of the proposed new 132 kV transmission line between the new on-site substation and the existing Botrivier substation on the palaeontology and archaeology of the area is considered to be low. No preference is expressed for any of the routes. It is recommended that spot checks are done of proposed pylon locations, once the final power line route has been determined, to ensure that no significant archaeological/heritage remains are impacted.

Visual Impact (Bapela Cave Klapwijk cc)

Cave Klapwijk and Associates cc were appointed by Arcus GIBB (Pty) Ltd (GIBB) to prepare a Visual Impact Assessment report for the proposed Wind Energy Farm (WEF) on farm properties in the Botrivier District of the Western Cape. The purpose of this Specialist Study is to determine the impact of the proposed wind energy farm and associated infrastructure, known as the proposed Langhoogte wind farm, on the visual and aesthetic character of the area. The rationale for this study is that the construction of the wind turbines may fundamentally alter the landscape character and sense of place of the local environment. The

objective of this specialist study is therefore to identify the magnitude and significance of the potential visual impact of the proposed wind farm development on the character and sense of place of the site and the surrounding area

This includes the following:

- Describe the visual character of the site and surrounding area by evaluating components such as topography and current land use activities. This will record the status quo of the visual environment;
- Identify elements of particular visual quality that could be affected by the proposed project;
- Describe the visual intrusion of the proposed project from identified critical areas and view fields;
- Determine the extent of the visibility of the project from surrounding areas as well as the night time effect caused by the lighting of the site; and
- Assess shadow flicker from the blades on homesteads in the vicinity of the turbines.

The WEF includes the wind turbines and other ancillary structures and temporary construction/laydown areas. These are:

Wind energy farm

The proposed wind energy farm will have a generating capacity of 112 – 162 MW and will comprise of 45 wind turbines, each of which will have between 2.5 – 3.6 MW generating capacity. The placement of these is determined by the wind speed over the site (this has been measured). The hub height will be 80-110m and the blade length will be approximately 40 – 60m.

The turbine positions have been guided by the wind profile of the site and preliminary assessments by specialists in the scoping phase. The final positions of the turbines will be informed by the findings of the Draft EIA study and Public Comment received, as well as the recommended impact mitigation measures included in the specialists reports .

Access and Service Roads

New roads will be required to provide access for vehicles to deliver, erect and maintain each wind turbine.

Underground cables ,Sub-stations and overhead electricity transmission lines

The turbines will be connected by underground power cables that will generally follow existing and new access roads to a new onsite substation. From this point the electricity will be conveyed via a proposed overhead 132kW line over other properties to the regional Houwhoek Substation to the south of Botrivier where it will enter the local electricity supply network

Temporary Construction Laydown Area and Construction Camp

A temporary area used during the construction phase of the project will accommodate vehicles, machinery, equipment and facilities such as diesel storage, ablution and dining facilities. In addition each turbine will require a laydown and hardstanding area of ~1,700 m² around its location to accommodate the cranes, components and assembly area.

Wind energy farm control room

A monitoring control room would be sited away from the site in an area still to be determined.

Staff accommodation

There will be no staff accommodation on the site. Staff will be housed in nearby towns

RELEVANT LEGISLATION AND POLICY

The key legislation (national, provincial and local) and policy relevant to the specialist study are the South African Heritage Resources 1999 (Act 25 of 1999) and the Western Cape . The NHRA considers the visual attributes of scenic parts of the country as being an integral part of the heritage resources and therefore has relevance to the visual impact assessment study. While there are no specific clauses and permits that relate to visual aspects these are taken to be part of the Heritage Assessment that is required for projects of a certain scale.

The Department of Environmental Affairs and Development Planning (DEA&DP) commissioned documents that give guidance on the selection of sites for wind energy farms and the visual assessments required for Environmental Impact Assessments as did the Theewaterskloof Municipality. These include:

CNdV Africa Planning and Design and Provincial Government of the Western Cape, (2006) Strategic Initiative to Introduce Commercial Land Based Wind Energy Development in the Western Cape. Towards a Regional Methodology for Wind Energy Site Selection¹.

OBERHOLZER, B, and CSIR (2005) Guideline for involving visual and aesthetic specialists in EIA processes. Provincial Government of the Western Cape: Department of Environmental Affairs and Solar Park Planning²
Savannah Environmental (2012) Regional Site Assessment for the Wind Energy Facility Development for the Theewaterskloof Municipal Area, Western Cape³

THE SITE IN CONTEXT

The preferred location for the wind turbine site was determined during the scoping phase and considered the following in addition to the existing constraints of slope, transmission lines, nature reserves and wetlands/drainage lines:

The site would be east and west of the R43 north of the junction with the N2 and north of the N2 as well.

Due to the elevated and rolling landform that is cultivated for wheat and canola, the wind turbines break the horizon in views from these roads which ever direction one travel.

The distance of the turbines from the R43 is 350m and the N2 700m. This will reduce the visual scale in views from the road corridors.

The position of turbines should be on the flatter land of the landform with a limit to the extent of their placement down slope towards the drainage lines.

The visually flowing contour ploughed fields of this agricultural landscape have no tall vegetation to screen or obscure views from and towards the site of the proposed wind turbines . The tall trees are those found around homesteads as established wind breaks. All of the wind turbines will be visually exposed in the landscape.

There are a number of homesteads within and surrounding the site and the town of Botrivier to the SSW will have views toward the site from the north eastern and eastern sides of the urban edge. According to the Strategic Development Framework Plan Botrivier will grow to the south of the N2.

The steep sided Botrivier Valley north of the town has varied land uses amongst them being a vineyard (Beaumont Estate) small holdings, accommodation and a film shoot area and studio.

THE VISUAL ASSESSMENT METHOD

The visual assessment method includes the following:

- The definition of the visual characteristics of the project;
- The definition and analysis of the visual environment using topography and view shed analysis and the ability of the landscape to accept the scale and density of the wind turbines;
- The determination of the visual impacts on defined characteristics of the setting using defined criteria to arrive at the significance of the impact;
- Produce a visual simulation of the wind energy farms on a photo from a view point in the landscape; and
- Develop mitigation measures for the project to reduce the visual intrusion of the wind turbines in the landscape.

The affected environment is described and includes the physical, the biophysical and the social attributes of the local setting and comment is made on the visual and other implications of the construction and operation stages of the project. The attributes that are described are: geology and soils, topography, vegetation, hydrology, climate, land use and the visual characteristics.

The visual quality included aspects of: Landscape Character, Visual Quality, the Visibility of the site and the Sense of Place. The latter is described as places that have a strong identity and character that is felt by local inhabitants and visitors. A sense of place is a social phenomenon that exists independently of any individual's perception yet is dependent on human engagement for its existence. Such a feeling is derived from the natural environment but is often made up of a mix of natural and cultural features in the landscape and generally includes the people who occupy the space. (adapted from Wikipedia)

IMPACT IDENTIFICATION AND ASSESSMENT

Impact Identification and Assessment was done according to the method specified for the construction and operation phases of the project. The decommission phase was included even although the activities are similar to the construction phase but in reverse order. The result on completion is different because of the removal of the large elements in the landscape setting. The visual impacts of the proposed wind farm are divided into two categories namely those associated with the construction phase which is activity based and those associated with the operation of the wind turbines which is presence based.

The former is a primary impact of short duration and easily mitigated after this phase is complete and includes aspects such as road and area clearing for access and construction activities, trenching for underground cables and excavation for tower foundations.

The latter is a secondary impact (other impacts that are related to its presence or function) of long duration and which is not easily mitigated.

The three elements of the project that were assessed are the Wind Turbines, the On Site Sub-station and three alternative routes for the 132kW overhead transmission lines from the onsite Sub-station to the Houwhoek (Botrivier) Eskom Substation south of the town and N2.

The identified visual impacts will be experienced mainly by two types of receptors: The person in the nearby homestead and the motorist/tourist in the area. Each will have a different exposure time to the visual impact of the wind energy towers in the landscape.

The visual intrusion that will be experienced by the two receivers is of long duration by the inhabitants of the homesteads and of short duration by motorists. The former will always have a particular view intruded upon by one or many wind turbine towers and the latter, who move through the landscape, will have limited view exposure times of the wind turbine towers.

The visual intrusion will most likely be more intensely experienced by the motorist because more towers will be seen at different distances from the road.

The **Construction stage** activities that cause visual change are the following activities:

Activity 1: Clearance of vegetation for new roads, lay down areas and related dust generation, construction of foundations and platforms for the wind turbines, the excavation of trenches for cables, construction of local substation and erection of wind turbines. Visual clutter associated with construction related facilities such as temporary site or construction camps.

Activity 2: Erection of the onsite substation and related new or upgraded access roads and construction camp.

The identified visual impact for each activity is described and assessed in terms of the affect and change of ,the visual intrusion on views, the alteration of the visual quality , visual character and sense of place.

For the **Operational stage** the same process was followed but the visual impacts identified include the following activities:

Activity 1: the presence of the wind turbines towers which will result in local visual change in the landscape.

Activity 2: the rotation of the blades which will result in local shadow flicker on the ground or on nearby structures and trees.

Activity 3: The presence of the onsite electrical substation and transmission line alternatives which will result in local visual change.

Activity 4: The presence of the red lights on the Nacelle that will result in a change in the night time view of the WEF site.

ALTERNATIVES

Site alternatives were considered by SAGIT during their early feasibility assessments. The Langhoogte site has however now been chosen and hence no alternative sites are being considered. The site was chosen from a number of alternatives during the feasibility stage. Certain criteria were used amongst them wind speed and frequency. Data from site measurements provided the confirmation that the site for this study was feasible and reasonable. For the EIA process, alternatives were limited to turbine layout alternatives and the 'No Go' or 'Do Nothing' scenario. During the EIA process, numerous iterations of turbine layouts were considered and a number of changes were made to mitigate visual impacts

Alternative routes for the proposed 132kW transmission line from the onsite sub-station to the Eskom Houwhoek sub-station were assessed. This included a Northern and a Southern route of which the latter consisted of 3 sub routes. In all 4 routes were assessed and the preferred alignment was identified.

For the 'Do Nothing' option the assumption is that agricultural practices will continue as will be the case with the wind turbines in place but the access roads , substation extension and transmission line will not be present in the landscape.

The significance of this option is that the status quo prevails and the scenic integrity of the area is retained. This is considered to be of Medium visual significance in the context of the setting and visual exposure that the site experiences because of its location relative to the R43

an acknowledged scenic route from the N2 northwards towards Villiersdorp and on to Worcester.

The N2 in this area also traverses scenic landforms of the rising contoured landform west of Caledon that merges with the surrounding scenic Houwhoek mountains to the west, the Riviersonderend mountains to the North and the Babilonstoring mountains to the south east.

MITIGATION

The nature of the wind energy farm is that the turbines are as tall as practical and are located where the wind flow is not turbulent. This is in valleys where the wind is funnelled by adjacent mountains or on the higher or prominent landforms as is the case for the Langhoogte wind energy farm. The turbines will therefore be highly visible and intrusive in a landscape. This situation does not lend itself to any meaningful reduction in the visual impact on the surrounding area. This can only be achieved by reducing the density of the turbines and their height. Technical studies indicate that the larger the more efficient and the spacing between turbines is considered to be not closer than 500m but this depends on the size. The proposed 100m towers with 53m blade length will comply with this distance.

Construction stage

(a) Access Roads

All the access roads to each wind turbine site, the temporary site camp and the permanent on site substation should be aligned along existing roads where possible and in a pattern that fits the field configuration. The reason is to reduce rapid surface water runoff which will likely cause erosion but importantly to conform to the visual pattern of the fields. This has been implemented in the current proposed design.

The limitation of dust generation is to be controlled preferably by using a dust binding emulsion that is sprayed over the entire road surface. An alternative is to spray the road surface with water at timely intervals to ensure that dust does not become a visual intrusion, health hazard or crop growth retardant.

All access roads will be planned and no ad hoc or temporary short cuts will be permitted to be developed without approval of the Engineer's Representative (ER).

(b) Laydown areas at turbine tower base

Where ever possible this ~1,700m² area where there is existing vegetation should not be cleared of vegetation but rather have it cut or rolled flat. The purpose is to limit dust and erosion.

Where the area has to be cleared for landform modification the surface must be stabilised by either a dust fixing emulsion or by water sprayed over the area regularly to ensure that dust is not generated by the activity in the area. Alternatively gravel could be used but would need to be removed afterwards.

(c) Site offices and stores area

The site must be selected to ensure that this will not be highly visible from main roads (R43) or nearby homesteads or residential estates. The perimeter shall be fenced with robust material and be at least 2m high. To reduce the visibility of the internal clutter the fence should be clad with a neutral coloured shade cloth or similar. The length of the fence that is covered will be determined by the position of the most sensitive receptor, for instance a road or homestead.

(d) Access RoadsConcrete batching plant

The site should be selected to ensure that it is not highly visible from surrounding main roads for nearby homesteads.

Screen fencing with shade cloth should surround the edges that are most visible to the homesteads and main roads.

Dust should be prevented by the use of emulsion sprayed on the ground or by regular spraying of water over the soil surface.

Operation stage

(a) Wind turbine location

Specific

As far as turbine location is concerned, the required mitigation has already been built into the proposed layout. All wind turbines have been located 700m from the road reserve edge along the N2 and 350m from the R43 reserve. This lesser distance than the 500 m is due to the turbines being visually reduced by their position on the downslope of the landform which has the same effect of extra distance on a flat landform.

The position of a wind turbine should ideally not be closer than 400m from the homestead and preferably in an arc from East-South-East to West-South-West. The reason for this is to eliminate the nuisance of flicker at certain times of the day and year due to the low sun angle.

(b) Onsite Substation

The scale, form, style and colour of the components of the structure should be compatible with existing Eskom Substations of similar scale.

(c) Colour of the wind turbine

While the standard colour of the wind turbine tower is off white the visual scale can be reduced slightly by the lower 6 metres being painted in equally spaced vertical stripes in four tints of green while leaving the original turbine colour as strips in between. The colour sequence is repeated around the tower. This striped colour variation will visually reduce the vertical scale of the turbines in view. It is noted however that the CAA's marking requirements for structures outside of aerodromes (CATs 139.01.33) states that all turbines should be painted bright white. The use of different colours will have to be confirmed possible with them.

(d) Wind turbine density

The density of wind turbines in the landscape has been determined to determine the intensity of visual intrusion. The spacing of the towers was determined from observation of the scale of existing transmission line towers in the similar scenic conditions. The distance was arrived at by scaling the tower in the landscape and by referring to the guidelines for country road buffers, the distance that was considered reasonable was 500m that would also apply to homesteads. In discussion the noise impact assessment recommended 400m as a buffer. It was agreed upon that this distance would also apply to the distance from homestead.

(e) Wind turbine height

The wind turbine height is directly proportional to the visibility in the landscape. However size is related to efficiency and the technical assessment selected the 100m tower which would also reduce the density of towers in the landscape.

CONCLUSION

The Site

The site analysis considered the suitable areas for turbine location and reviewed this in the context of the 2006 Strategic Assessment by the Provincial Government of the Western Cape.

The buffers recommended in this document were applied to the site with the result that limited suitable areas remained for wind turbine location. However the preferred location of the turbines, based on site constraints, natural and imposed by motivated buffers that were discussed and agreed with team members and the Client, some of which originated from the Strategic Assessment, was assessed.

The site area is visually defined by the highest rounded landforms of the ridge line along which the R43 is aligned north of the junction with the N2. The agricultural character and sense of place are mainly derived from the pattern of the contoured fields and the extensive all round views to the mountains. Visual change in the long term of the area is not foreseen as the area continues with the specialised task of producing wheat and canola.

The site's exposed position provides distant views toward the surrounding mountains and southward down the Botrivier valley to the sea near Kleinmond. The site is visible from the lower reaches of the Houwhoek pass eastbound over Botrivier at a distance of approximately 7km and the first view westbound on the N2 is NW from the road before it reaches the high point east of the roadside shop on Dassieskraal.

Visual Impacts

With regard to the assessment of the visual impacts the construction and the decommissioning phases are primary impacts, of short duration and are easily mitigated and therefore have a low significance visual impact.

However it is the operational phase (a long term secondary impact) that will result in high visual impacts on visual quality, landscape character of the setting and sense of place due to the tall wind turbines.

While the turbines do not block the view they add a vertical element to the scene that still allows distant vistas to be appreciated.

The high visual intrusion zones of views are recognised to be within 500m of roads, homesteads and sensitive land uses. This buffer is in accord with that used in the Strategic Assessment Guideline for local roads. The positions of wind turbines reflect this spacing as shown on the Analysis maps Figure 4 &5. However a distance of 350m was agreed upon for the R43 because this lesser distance will be visually reduced relatively by their position on the downslope of the landform which has the same effect of an extra 150m distance on a flat landform.

The finding is that the medium density and tall scale of the wind turbine towers in the landscape will have a high impact on the views from within and towards the site. The assessment method used shows the significance of the visual impact as medium which means that according to the assessment criteria the visual aspect and the mitigation measures will require consideration in the decision making.

Shadow Flicker

The aspect of shadow flicker caused by the rotating blade's shadow over ground, structures and trees was researched (Wind Turbine Shadow Flicker Study. Dept. of Energy and Climate Change, UK 2011) and the conclusion is that it has no risk to health but that where problems exist these can be mitigated by shut down of the turbine for certain periods. This phenomena is considered to be of low impact and low significance by correct positioning relative to homesteads, as a mitigation measure.

The Night scene

The night scene will be altered by the double red lights on the top of the turbine housing (Nacelle). This is not considered a high visual impact although the area of the site will be more visible from further at night as a result of the glowing lights. On cloudy or moonless nights the

towers will not or hardly be visible and therefore the significance is rated as low. The red lights will have similar intensity to those on tall masts or telecom towers.

This visual intrusion or impact will not alter the night scene significantly but the matter will require consideration in decision making.

Mitigation Proposals

The medium density of wind turbines with an approximate spacing of 500m does reduce the visual intrusion in views toward and within the site.

Considering that the required mitigation regarding turbine size, micro-siting, and WEF density have already been built into the proposal, the mitigation of the visual impact of such tall animated structures in a scenic setting is confined to cosmetic methods. The reduction of the visual scale can be achieved at close range, 100 to 300m by painting vertical broad stripes of 4 shades of green with the off white or grey of the tower between each stripe. This to be done to a height of 6 metres and will visually fuse the base with the landscape. It is noted however that the CAA's marking requirements for structures outside of aerodromes (CATs 139.01.33) states that all turbines should be painted bright white. The use of different colours will have to be confirmed possible with them.

The recommendation to relieve the visual impact of scale in views of the site from the R43 is that the minimum distance from the road reserve edge is to be 500m but due to the turbines being located on the downslope eastern side, from the road, 350m is considered to have the same effect.

The layout of the turbines on the site has responded to the visual aspects identified in the 'implications for the project' comment and the constraints shown on the Analysis Plan. Mitigation measures have therefore been incorporated by the micro siting of the towers.

The remainder of the mitigation will relate to the construction and decommissioning phases. This will have to do with dust suppression, surface water management to reduce erosion and siltation of drainage lines and the stripping and stockpiling of topsoil for the rehabilitation of road edges and temporary laydown and working areas. The selection of existing roads for access routes and cable trenches will limit the physical change to the land and detail planning with this in mind must be promoted and implemented.

Conclusion

While the wind turbines have high visual intrusion in views from roads and homesteads the significance of this impact is medium with mitigation in place. In addition the monitoring of the implementation of the mitigation measures is most important as the attention to detail will significantly reduce the visual impact of the construction phase and later of the decommissioning phase. The medium significance rating requires that the visual aspects must be considered in the decision process because of the scenic nature of the setting, the landscape character and the sense of place.

**ENVIRONMENTAL IMPACT ASSESSMENT FOR THE
ESTABLISHMENT OF THE PROPOSED LANGHOOGTE WIND
FARM, WESTERN CAPE PROVINCE:
ENVIRONMENTAL IMPACT REPORT**

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- Table 1:** Grading of heritage resources after Baumann and Winter (2005).
Table 2: List of Buildings and Graveyards in the study area.

FIGURES

Figure 1: An aerial map of the location of the proposed Langhoogte Wind Farm to the east of Botrivier and situated along the N2 and R43.

Figure 2: The proposed layout of the wind energy facility, showing the location of the turbines and associated infrastructure.

Figure 3: The 132 kV overhead power line alternatives which will connect to the Houhoek substation.

Figure 4: The position of the farm buildings and graveyards within the study area.

Figure 5: The three southern powerline alternatives (Options 1-3) are shown as yellow lines. The blue lines indicate the tracks recorded during the survey.

Figure 6: The position of the Klipheuwel, Caledon and Dassiesfontein wind energy facilities with respect to the Langhoogte WEF.

APPENDICES

- Appendix 1:** Palaeontological Assessment
Appendix 2: Pre-colonial and Historical Archaeology
Appendix 3: Visual Impact Assessment
Appendix 4: Input of the Bot River Aesthetics Committee (outstanding)

ABBREVIATIONS

DEA&DP	Department of Environmental Affairs and Development Planning
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
HWC	Heritage Western Cape
LSA	Late Stone Age
MSA	Middle Stone Age
NHRA	National Heritage Resources Act
SAHRA	South African Heritage Resources Agency

GLOSSARY

Archaeology: *Remains resulting from human activities which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.*

Early Stone Age: *The archaeology of the Stone Age between 700 000 and 2500 000 years ago.*

Fossil: *Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.*

Heritage: *That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999.*

Late Stone Age: *The archaeology of the last 20 000 years associated with fully modern people.*

Middle Stone Age: *The archaeology of the Stone Age between 20 000-300 000 years ago associated with early modern humans.*

Palaeontology: *Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.*

Structure (historic): *Any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith. Protected structures are those which are over 60 years old.*

Details of specialist and expertise

Mr David Halkett has a Masters degree in Archaeology from the University of Cape Town. He is a founder member of the Archaeology Contracts Office and a Director of ACO Associates cc. He has 22 years of working experience in heritage throughout southern Africa. His research interests are concerned with the archaeology of hunter-gatherer groups in the Western Cape. He is a long-standing member of the Archaeology, Palaeontology and Meteorites Committee for Heritage Western Cape (HWC) and a member of IACOM. He is accredited with Principal Investigator status with the Association of Professional Archaeologists of Southern Africa.

Dr Lita Webley has a Masters Degree in Archaeology from the University of Stellenbosch and PhD in Archaeology from the University of Cape Town. She has lectured in archaeology at a number of universities and has worked in museums for 17 years. Her research interests are concerned with the archaeology of Khoekhoen groups in the Northern Cape. She is an archaeologist with 15 years of working experience in heritage consultancy. She is accredited with Principal Investigator status with the Association of Professional Archaeologists of Southern Africa.

Dr John Almond has an Honours Degree in Natural Sciences (Zoology) as well as a PhD in Palaeontology from the University of Cambridge, UK. He has been awarded post-doctoral research fellowships at Cambridge University and in Germany. His current palaeontological research focuses on fossil record of the Precambrian - Cambrian boundary and the Cape Supergroup of South Africa. Since 2002 Dr Almond has also carried out palaeontological impact assessments for developments and conservation areas in the Western, Eastern and Northern Cape under the aegis of his Cape Town-based company *Natura Viva* cc. He is a long-standing member of the Archaeology, Palaeontology and Meteorites Committee for Heritage Western Cape (HWC) and an advisor on palaeontological conservation and management issues for the Palaeontological Society of South Africa (PSSA), HWC and SAHRA. Dr Almond is an accredited member of PSSA and APHP (Association of Professional Heritage Practitioners – Western Cape).

Alan Cave of Bapela Cave Klapwijk cc holds a BSc in Mining Engineering, a MPhil in Landscape Design and has 38 years experience in the field of landscape planning, design and environmental impact assessment. He is a member of the Certification Board of the profession of Impact Assessors, a member of IAIA, a Fellow of the Institute of Landscape Architect and a Pr LA with the South African Council for the Landscape Architectural Profession SACLAP.

His experience in the gold mining field in SA and abroad (5years) reinforces his input of his chosen field of specialisation in environmental planning, assessment and landscape design. His pioneering work in Visual Impact Assessment in RSA has assisted in the understanding of this aspect as a tool for planning and design. He has gained experience in large scale internationally funded projects by acting as project leader for the environmental impact assessment for the new Letsibogo Dam in Botswana and the new N3 Toll Road in South Africa. Donors for the former included Sweden, Denmark, the UK and the EU while the latter included the African Development Bank. Both of the reports received favourable reviews.

He has experience in large and small project visual analysis and impact assessment. Recent examples include Nuclear 1 three sites for future nuclear power stations, the Pebble Bed Modular Reactor and the .Perseus -.Hydra 400kv line Dealesville to De A (approx 300km).

1 INTRODUCTION

1.1 Background

ACO Associates was appointed by Arcus Gibb (Pty) Ltd to conduct a Heritage Impact Assessment of several farms adjoining the N2 between Botrivier and Caledon in the Overberg, Western Cape (Figure 1). The proponent (SAGIT Energy Ventures) proposes to construct a wind energy facility of –112-162 MW, comprising 45 wind turbines along with supporting infrastructure. This proposal has triggered a full EIA process.

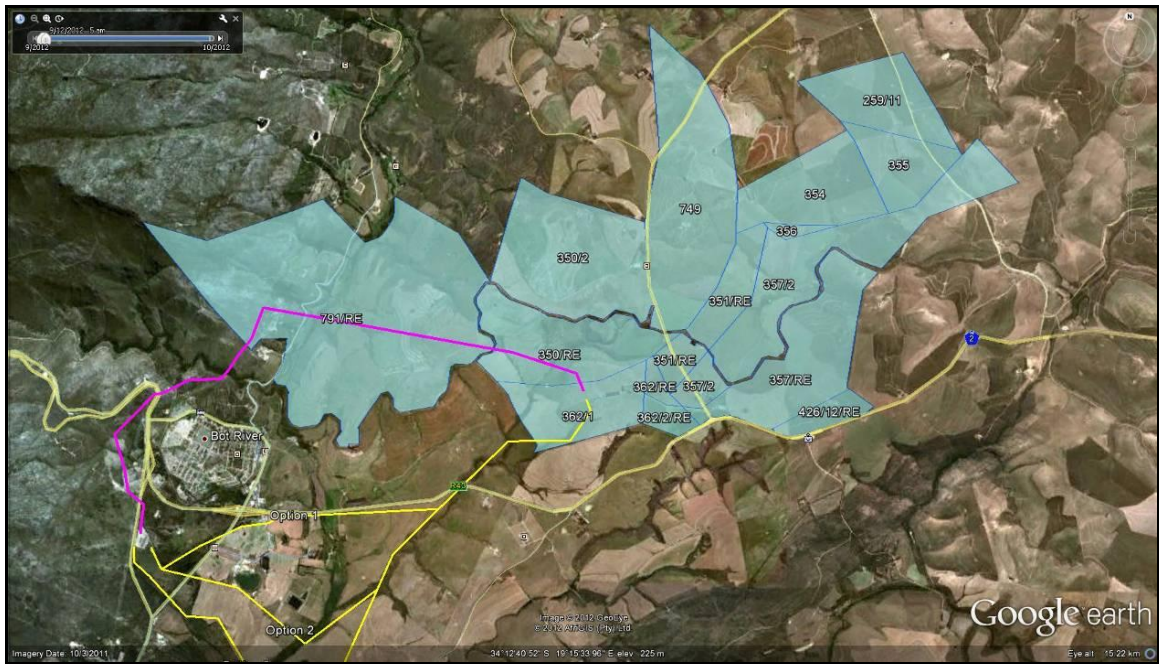


Figure 1: An aerial map of the location of the proposed Langhoogte Wind Farm to the east of Bot River and situated along the N2 and R43.

1.2 The proposal

1.2.1 Affected Farms

- The Remainder of the Farm 791;
- The Remainder and Portion 2 of Farm 350 (Keissies Kraal);
- The Remainder of Farm 351;
- The Remainder and Portion 1 of the Farm 362 (Langhoogte);
- Portion 2 of the Farm 357 (Langhoogte);
- Farm 354;
- Farm 355 (Bruinklip);
- Farm 356;
- Portion 11 of the Farm 259 (Rietfontein);
- Farm 749

The proponent has identified the site as being suitable as it is situated on elevated ridges within the rolling wheat lands of the Overberg. The rolling hills in this area allow high winds to

be obtained. The study area is zoned agricultural and no re-zoning is required as the land will continue to be used for agricultural purposes;

1.2.2 Micro-siting

The turbines are located to the north of the N2 and on both sides of the R43 to Villiersdorp (Figure 2).



Figure 2: The proposed layout of the wind energy facility, showing the location of the turbines and internal access roads.

1.2.3 Turbines

The size of turbines will depend to some extent on which supplier is selected. For the purposes of the EIA, the worst case scenario would be the upper limit with the following likely range:

- Power: 2.3 – 3.6 MW / unit
- Hub height: 80 – 110m
- Blade length: 40 – 60m

1.2.4 On-site Sub-station

The footprint of the sub-station will be approximately 40m x 40m. The maximum height of structures within the sub-station will be approximately equal to the power line towers i.e. 23m high.

1.2.5 Roads

Access roads to the site from the main road (N2 & R43) will need to be constructed. So too will internal access roads to each wind turbine and to the sub-station. The final width of roads will be 5m, but the construction footprint (disturbance area) would be approximately 9m. The total length and areas of the proposed roads has yet to be calculated.

1.2.6 Laydown Areas

Laydown areas will be constructed at each turbine.

1.2.7 Trenches

The trench width for the underground cabling will be 1m. The trenches generally follow the roads hence the total disturbance area will be limited to approximately 2m. Where the trench leaves the road, disturbance is will be approximately 4m. The total length and areas of the proposed trenches has yet to be calculated.

1.2.8 Overhead Power Lines

It is proposed to construct a 132 kV overhead power line which will feed into the Eskom electricity network. The power line will be a monopole structure of the 259 series type up to 24m in height (Plate 1).

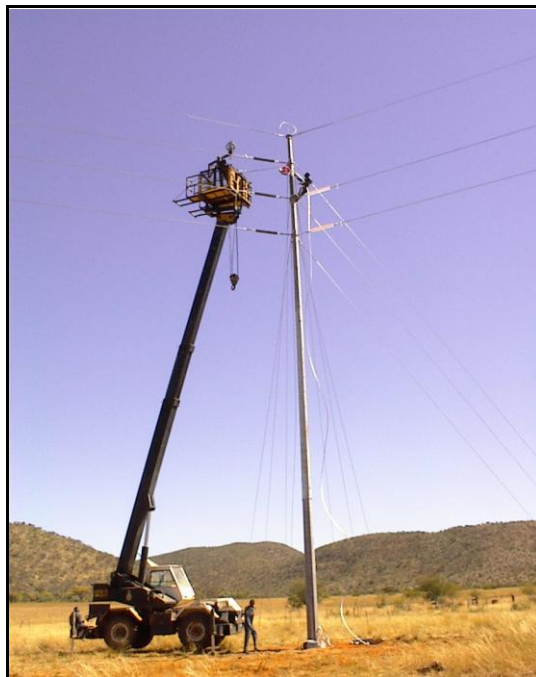


Plate 1: View of the type of 132kV pylon to be constructed.

Four alternative routes have been proposed for the power lines to connect with the Houhoek sub-station located to the south-east of Botrivier (Figure 3).

- The Northern route (alternative 1): The northern route is alternative 1 and the route taken will be as per Figure 3. There are a number of challenges with regard the Northern route including: resistance from landowners, the visual impact with crossing the valley to the north of Bot River and the engineering complexities with crossing the N2 on the Houwhoek Pass.
- The Southern route (preferred route): is SAGIT's preferred route. Three possible sub-routes are proposed and assessed as alternatives. It is proposed to run as close as possible to the existing 66kV Eskom line. SAGIT will build the line and pay for it but the line and the servitudes will revert to Eskom once operational. Eskom have confirmed that they will expand their current network distribution between the Houhoek substation and Caledon in the future and the expansion will take the form of a new double circuit 132kV line.

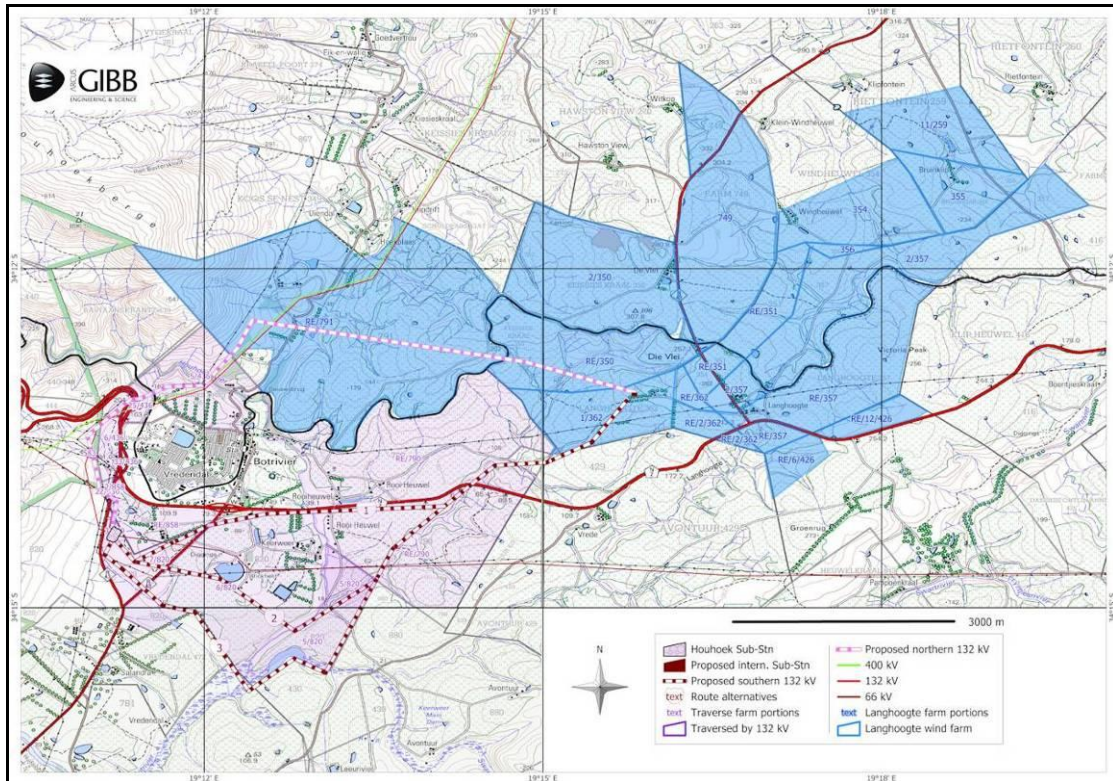


Figure 3: The 132 kV overhead power line alternatives which will connect to the Houhoek substation.

1.3 Legislative and Policy Context

The basis for all heritage impact assessment is the National Heritage Resources Act No 25 of 1999 (NHRA) which in turn prescribes the manner in which heritage is assessed and managed. In the case of Environmental Impact Assessments in the Western Cape, the guidelines published by the Provincial Department of Environmental Affairs and Tourism (the Department of Environmental Affairs and Development Planning (DEA&DP)) are directly based on the provisions of the National Heritage Resources Act.

The NHRA has defined certain kinds of heritage as being worthy of protection, by either specific or general protection mechanisms. In South Africa the law is directed towards the protection of human made heritage, although places and objects of scientific importance are covered. The National Heritage Resources Act also protects intangible heritage such as traditional activities, oral histories and places where significant events have happened. Generally protected heritage which must be considered in any heritage assessment includes:

- Cultural Landscapes;
- Buildings and structures greater than 60 years of age;
- Archaeological sites greater than 100 years of age;
- Palaeontological sites and specimens;
- Shipwrecks and aircraft wrecks;
- Graves and Graveyards.

Section 38 of the NHRA requires that Heritage Impact Assessments (HIA's) are required for certain kinds of development such as rezoning of land greater than 10 000m² in extent or exceeding 3 or more sub-divisions, or for any activity that will alter the character or landscape of a site greater than 5000m².

The Notice of Intent to develop was submitted to Heritage Western Cape in February 2011 and the following Interim Comment was issued on 14 July 2011:

“An HIA is required consisting of an Archaeological study, Palaeontological Study, Visual Study with an integrated set of recommendations”.

Subsequently additional farms were added to the project and correspondence was entered into between Gibb and Heritage Western Cape in this regard (Emil Twycross and Shaun Dyers; Walter Fyvie and Jenna Lavin).

This HIA integrates the findings of the Archaeological, Palaeontological and Visual studies. Although not specifically requested, it takes cognizance of the Built Environment and Cultural Landscape where this is appropriate.

1.3.1 Cultural Landscape

Section 3(3) of the NHRA, No 25 of 1999 defines the cultural significance of a place or objects with regard to the following criteria:

- (a) its importance in the community or pattern of South Africa’s history
- (b) its possession of uncommon, rare or endangered aspects of South Africa’s natural or cultural heritage
- (c) its potential to yield information that will contribute to an understanding of South Africa’s natural or cultural heritage
- (d) its importance in demonstrating the principal characteristics of a particular class of South Africa’s natural or cultural places or objects
- (e) its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group
- (f) its importance in demonstrating a high degree of creative or technical achievement at a particular period
- (g) its strong or special association with a particular community or cultural group for social cultural or spiritual reasons
- (h) its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and
- (i) sites of significance relating to the history of slavery in South Africa.

1.3.2 Scenic Routes

While not specifically mentioned in the NHRA, No 25 of 1999, Scenic Routes are recognised by DEA&DP as a category of heritage resources. In the DEA&DP Guidelines for involving heritage specialists in the EIA process, Winter & Winter⁴ comment that the visual intrusion of development on a scenic route should be considered a heritage issue.

1.3.3 Heritage Grading or Sensitivity Analysis

Heritage resources are graded following the system established by Winter and Baumann⁵ in the guidelines for involving heritage practitioners in EIA’s (Table 1).

Table 1: Grading of heritage resources after Winter and Baumann⁶.

Grade	Level of significance	Description
1	National	Of high intrinsic, associational and contextual heritage value within a national context, i.e. formally declared or potential Grade 1 heritage resources.
2	Provincial	Of high intrinsic, associational and contextual heritage value within a provincial context, i.e. formally declared or

		potential Grade 2 heritage resources.
3A	Local	Of high intrinsic, associational and contextual heritage value within a local context, i.e. formally declared or potential Grade 3A heritage resources.
3B	Local	Of moderate to high intrinsic, associational and contextual value within a local context, i.e. potential Grade 3B heritage resources.
3C	Local	Of medium to low intrinsic, associational or contextual heritage value within a national, provincial and local context, i.e. potential Grade 3C heritage resources.

1.3.4 Provincial Wind Energy Policy and Guidelines

A pilot study commissioned by the Provincial Government of the Western Cape: "Towards a Regional Methodology for Wind Energy Site Selection in the West Coast Region", is the only locally available policy guideline⁷. The study considered landscape character rather than the "cultural landscape or heritage" but concluded that wind energy facilities can have a profound impact on the surrounding landscape in terms of the natural qualities of places. In terms of landscapes and heritage, there are no pro-active detailed local regional studies that can be consulted, however the Western Cape pilot study recognises that severe impacts can occur and suggests a buffer zone of 500m from heritage sites (although it is the opinion of the author of this report that this should not be a blanket provision but should take into account the heritage resources on a case by case basis).

Neither the South African Heritage Resources Agency (SAHRA) nor any other heritage compliance organisation has developed a specific policy with regards to heritage and renewable energy, although the issue has received considerable attention in European countries.

A recent decision by the Department of Environmental Affairs (DEA) with respect to Wind Energy Facilities is discussed below to illustrate the kinds of outcomes which may be anticipated:

In the Environmental Authorisation (12/12/20/1746) for the Klipheuwel and Dassiesfontein Wind Farm, DEA implemented a:

- 2 km buffer around the historic homestead of Boontjieskraal which is situated on the N2 between Botrivier and Caledon. Boontjieskraal was identified by Heritage Western Cape as a site of potential Grade 2 (Provincial) heritage importance.
- Elsewhere, they have implemented a 2 km buffer along local roads, through proposed wind energy facilities which have high scenic value.

1.3.5 Permit requirements

A permit, issued by Heritage Western Cape (HWC), will be required to:

- Demolish any houses or structures such as barns, kraals, etc older than 60 years; and
- Destroy archaeological sites or material (see Glossary).

Human remains are considered a national issue in terms of the NHRA. Section 36 of the NHRA and the regulations attached thereto are implemented by the SAHRA Burials Unit in Pretoria. They are the permitting authority and are responsible for the issuing of exhumation/grave relocation permits.

If human remains are uncovered during the development they may only be excavated or exhumed with a permit issued by the SAHRA Burials Unit.

1.3.6 Consultation with Registered Conservation Bodies

In terms of NHRA, registered conservation bodies need to be consulted during the EIA process. The closest registered Conservation Body to the proposed development is the Bot River Aesthetics Committee which is concerned with the Bot River Conservation area or the area adjoining it. The Committee did not make a formal presentation during the Public Participation Process. Two emails and three phone calls were made to the previous Chairperson and the current Chairperson who undertook to provide written input into the proposed development. This was not available at the time of completion of the report.

1.4 Scope and limitations

The assessment involved site visits by a palaeontologist, archaeologists and visual impact specialists to assess the impacts of the proposed developments on the heritage of the area.

The Interim Comments to the NID did not request an assessment of the Built Environment or the Cultural Landscape but these are considered briefly in this report to ensure that they are adequately addressed.

A complete and comprehensive survey of the landscape was not possible. During the survey by the archaeologists, the undulating landscape was found to be covered in agricultural crops (wheat, lucerne, canola, etc) to the height of at least 50cm. In the majority of cases, it was not possible to survey individual turbine locations or to follow the routes of access roads or underground cabling as this would have meant damaging the crops. Visibility was considerably constrained.

1.5 Assessment Methodology

A desk top pre-feasibility study was commissioned in January 2011 on a smaller number of farms. Subsequently, a number of additional properties were added resulting in a revised report, with the final Scoping Report completed in October 2011. A short site visit was undertaken by Jayson Orton on 19 August 2011 to assess any "fatal flaws". The Draft Scoping Report was made available in April 2012 and a copy submitted to Heritage Western Cape. The fieldwork for the facility was undertaken in September 2012 by Lita Webley and David Halkett of ACO Associates cc.

The information in this report draws on other studies in the Caledon area. Although there is little published information on the archaeology and built environment of the study area, primary and secondary sources of information with respect to the general area are readily available for consultation.

The Archaeology Contracts Office was responsible for the HIA studies for the Caledon Wind Farm⁸ and the Klipheuwel and Dassiesfontein Wind Farm by Hart⁹. Heritage indicators for this area have therefore been identified and have provided important background information for the Langhoogte Wind Energy Facility.

1.5.1 Study area sensitivity analysis

The study area is of low palaeontological and archaeological sensitivity.

1.6 Description of any assumptions made, uncertainties or gaps in knowledge

With regard Palaeontology, Almond (Appendix 1) points to the inadequate database for fossil heritage for much of the RSA. Most development study areas have never been surveyed by a palaeontologist. There is variable accuracy of geological maps which underpin desktop studies. There is inadequate sheet explanations for geological maps, with little or no attention paid to palaeontological issues in many cases, including poor locality information. The extensive relevant palaeontological “grey literature” is not readily available for desktop studies. There is an absence of a comprehensive computerized database of fossil collections in major RSA institutions which can be consulted for impact studies. Together, these limitations can result in:

(a) *under-estimation* of the palaeontological significance of a given study area due to ignorance of significant recorded or unrecorded fossils preserved there, or

(b) *over-estimation* of the palaeontological sensitivity of a study area, for example when originally rich fossil assemblages inferred from geological maps have in fact been destroyed by tectonism or weathering, or are buried beneath a thick mantle of unfossiliferous “drift” (soil, alluvium *etc*).

Similarly with regard Archaeology (Appendix 2), no Stone Age archaeological research has been conducted inland of the Overberg coastal zone. There are no reports to consult. Our information is limited to the consultancy reports for development in this area which have been conducted in the last decade. Since reports point to the spread of Early Stone Age artefact scatters in the Overberg, it is assumed that further scatters of Early Stone Age implements will be found in fields which are presently covered in crops, but that these artefact scatters are of low significance.

The Overstrand Heritage Survey¹⁰ is concerned with the area to the south of the proposed facility. It unfortunately does not address heritage issues with respect the Botrivier area. There are no specific assessments of the Built Environment or Cultural Landscape which can be consulted. It is assumed that some of the conclusions which are made with respect the Overstrand, can be applied to the study area.

This study assumes that historical graveyards will be found within a radius of 400m of occupied or abandoned homesteads, and that is it unlikely that graveyards will be found in agricultural lands.

2 DESCRIPTION OF AFFECTED ENVIRONMENT

The study area is situated in the rolling wheat fields of the Overberg region between Caledon and Botrivier and can be reached from the N2 and the R43 to Villiersdorp (Figure 1). A full visual description of the landscape is provided in the Visual Impact Assessment (Appendix 3).



Plate 2: View west from turbines 32 and 42 towards the Botrivier Valley, with the arrow indicating the location of Botrivier.



Plate 3: View east from turbine 15 looking towards the mountains around Caledon. Note the groves of blue gum trees around the farmsteads.

2.1 Palaeontology

The palaeontology of the area is discussed in Appendix 1.

The Langhoogte wind farm study area is largely underlain by Early to Middle Devonian marine sediments of the Bokkeveld Group, with a small area of older Table Mountain Group rocks in the extreme west. The Table Mountain Group rocks typically only contain very sparse fossil remains. In contrast, the Bokkeveld Group rocks were probably once highly fossiliferous. However their fossil content has been largely destroyed by intense tectonic deformation as well as by deep chemical weathering during the Late Cretaceous to Tertiary period. Exposure of these Palaeozoic rocks is very limited due to extensive cover by superficial sediments that are themselves very poorly fossiliferous to unfossiliferous. A variety of Paleogene (Early Tertiary) to Quaternary duricrusts are present in the broader study region but these are also largely unfossiliferous. Apart from local occurrences of poorly-preserved trace fossils of limited scientific interest, no fossil remains were noted during a two-day field assessment. Previous field-based studies in the southern Cape coastal region have also yielded very few fossil remains and there are very few records of fossils from this region in the literature. The effective paleontological sensitivity of the Table Mountain Group, Bokkeveld Group and younger sedimentary rocks in the study area is now very low.

2.2 Archaeology

The Archaeology is discussed in Appendix 2.

Archaeological consultancy reports for the area between Botrivier and Caledon suggest that scattered Stone Age archaeological material dating from the Early, Middle and Late Stone Age periods will occur. The survey by Webley & Halkett¹¹ of the Caledon WEF, which adjoins the proposed Langhoogte WEF, identified scatters of Early Stone Age (ESA) material on ploughed lands. In his survey on the farms Klipheuwel and Dassiesfontein to the south of the N2, Hart¹² also identified some scatters of ESA material. Kaplan¹³ has also undertaken surveys around the Botrivier area and found some ESA artefacts.

Very little is known about the distribution of the Later Stone Age peoples (San and Khoekhoen) although it is known that Khoekhoen groups such as the Hessequa and Chainoqua frequented the Overberg before the advent of the colonial farming period¹⁴. The name of "*Keissies Kraal*" may be a reference to a Khoekhoen "kaptein" who lived in the area and according to du Toit¹⁵ the name Boontjieskraal is a reference to a Khoekhoen called "Jan Buntjie". Little Later Stone Age material has been recorded in this area.

2.3 Historical Background

It was the attraction of trade with the Khoekhoen which prompted the establishment of a VOC outpost at Compagnies Drift (the present Beaumont Wine Estate) on the Botrivier from at least 1731¹⁶. Of importance on the farm is a historic water mill which has been recently restored.

The village of Botrivier is situated at the base of the Houwhoek Pass, at the entrance to the Overberg and has its origins on the historic farm of Compagnies Drift. The farm was situated on the drift across the Botrivier used by all the early travellers travelling into the Overberg. Josias de Kock of Compagnies Drift was famous for providing accommodation for travellers from 1778¹⁷. Many stayed overnight at the farm, eventually resulting in the development of the village. The Botrivier Hotel was built in the early 1890s with additions added later. The railway line was constructed through the town in 1902, further increasing the need for accommodation for travellers. There are some buildings in the town which date to the early 20th century but according to du Toit¹⁸ the majority date after 1940. Thus while the village has historic roots, much of the development has taken place within the last 60 years. It does not feature in Fransen's description of the old towns and villages of the Cape¹⁹.

Many of the farms which fall in the study area were earlier loan farms. This is discussed further below.

2.4 Cultural Landscape and Scenic Routes (Visual)

The Cultural Landscape and Scenic Routes are described in Appendix 3.

This area has been subjected to generations of agriculture. The farm Botrivier, for example, was one of the earliest farms in the Overberg to obtain a licence for the sowing of wheat dating back to 1708 and merino sheep were being grazed on the farm of Boontjieskraal (midway between Botrivier and Caledon) by 1803. The entire surrounding area is rural in character with wheat and stock farming being the primary activities. The landscape has been transformed by generations of farming and represents an agricultural landscape (also termed "Rural Farmland Landscape") of cultural significance²⁰.

A landscape character assessment of the Overstrand, to the south of the study area, formed part of the Overstrand Heritage Survey²¹. The assessment was undertaken by Bernard Oberholzer Landscape Architect. Its aim was to provide an overview of the components that

constitutes the landscape character of the area; the vulnerabilities of these landscapes to human intervention and to provide a scenic route network and associated visual corridors.

The area is considered to have aesthetic value with high tourism potential, being situated on the N2. It also straddles the scenic route (R43) to Villiersdorp. The facility is situated some 25km south-west from the historic Moravian mission settlement of Genadendal and 32km from Greyton, a popular small village situated in the foothills of the Riviersonderend Mountains. The historic farmhouse of Boontjieskraal is located 3.5km to the south-east of the facility.

3 SUMMARY OF HERITAGE FINDINGS

3.1 Palaeontology

The two-day palaeontological field trip reported no palaeontological findings (Appendix 1).

3.2 Archaeology

While no ESA stone scatters were identified during this survey (Appendix 2), they have been identified on the adjoining Caledon wind energy facility as well as the Dassiesfontein and Klipheuwel wind energy facilities. It is assumed that they occur across the landscape but that they are presently covered in agricultural crops.

The archaeological survey identified a series of three sites of Middle Stone Age and Later Stone Age attribution which were clustered around a little rocky outcrop behind De Vlei farmhouse. It confirms that *in situ* archaeological sites may be found in patches of unploughed lands on koppies or along river banks.

The discovery of a lower grindstone is interesting as no Later Stone Age sites have been recorded in this area previously and this suggests that San hunter-gatherers and/or Khoekhoen pastoralists may have moved across this landscape in the prehistoric past but that their archaeological signature has been erased by two hundred years of agriculture.

No historical archaeological remains were identified. A single roughly hewn stone marker was recorded.

3.3 Built Environment & Graves

Heritage Western Cape did not request a specialist Built Environment report in their interim comment to the Notice of Intent to Develop. However, the Built Environment is briefly outlined here for the sake of providing a complete heritage assessment.

3.3.1 Boontjieskraal

The significance of the Boontjieskraal farmhouse has been discussed by Fransen²² and was identified by Hart²³ during his survey for the Dassiesfontein and Klipheuwel Wind Farms. Boontjieskraal is an historic farm complex on the northern side of the N2. It was a stock post established in the days of Simon van der Stel. Although the original buildings have been modified, Boontjieskraal is famous on account of its meandering *ringmuur* and as such is an important place-marker on this scenic strip of the N2. Heritage Western Cape issued a comment to the proposed wind farm in January 2011 in which they ascribed a potential Grade 2 significance to the farm and initially implemented a 5km buffer around the farmhouse. This was subsequently reduced to 2km on appeal and supported in the Environmental Authorisation for the wind farm.

Boontjieskraal is located some 3.5km to the south-east of the closest turbine position on the proposed Langhoogte wind farm.

3.3.2 Compagnies Drift (Beaumont Estate)

The town of Bot River is situated on a portion of Beaumont Estate (originally called Compagnies Drift). According to Fransen²⁴ this historic farm was originally a loan farm dating to 1731. The homestead comprises a T or longhouse that was later converted into an H. The property is particularly significant because of the well-preserved water-mill. There is also a

millers house and a nearby cottage which is described as being of “great age”. This werf, comprising the house, mill and cottages would be considered of Grade 3A significance.

Beaumont is located 2.7km to the west of the proposed facility.

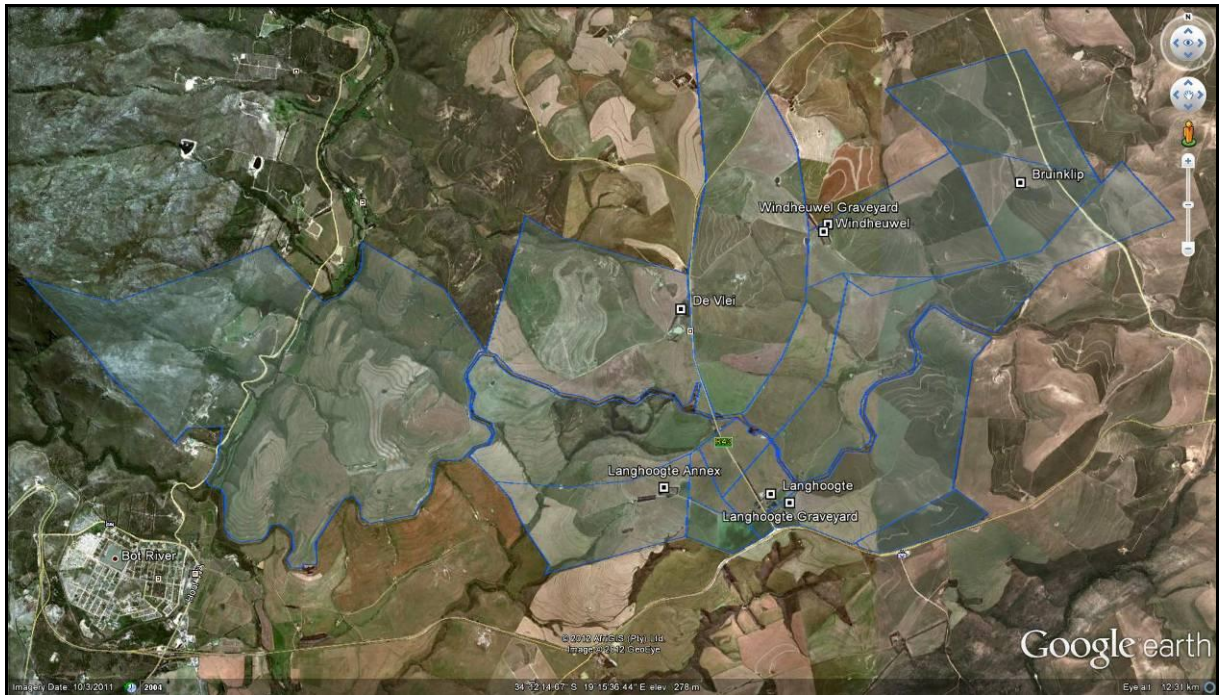


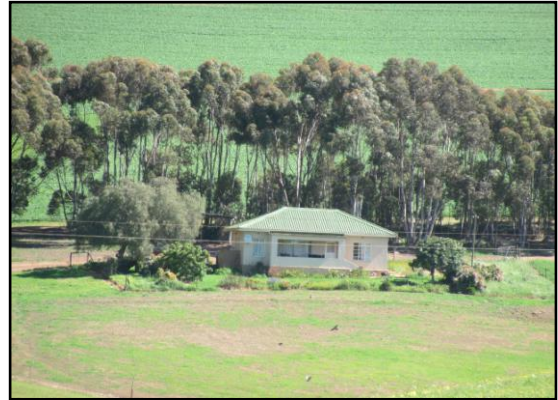
Figure 4: The position of the farm buildings and graveyards within the study area.

Table 2: Location of Farm Buildings and Graveyards

Name of Farm Buildings	Co-ordinates	Grading
Bruinklip	S34 11 11.83 E19 18 40.40	ungraded
Windheuwel	S34 11 29.80 E19 17 11.19	ungraded
Windheuwel graveyard	S34 11 27.65 E19 17 13.36	High significance (Grade 1)
Langhoogte	S34 13 08.54 E19 16 46.62	ungraded
Langhoogte graveyard	S34 13 11.87 E19 16 55.55	High significance (Grade 1)
De Vlei	S34 12 01.27 E19 16 07.31	ungraded
Langhoogte Annex	S34 13 06.93 E19.15.58.37	ungraded

The farms are discussed as they are found from east to west:

Rietfontein (Portion 11 of the farm 259) comprised part of a much larger farm (SG 402/1832) with a circular shape. The survey diagram of 1832 indicates a “dwelling house” on the property, but the house is not situated on Portion 11. There is no house on this portion of land.



Plates 4 & 5: The farm buildings on Bruinklip.

Bruinklip (Farm 355) dates to 1921 (SG 1021/1921) and may originally have been part of the farm Langhoogte. There are two houses on the farm as well as some sheds (Plates 4 & 5). The houses date to within the last 60 years and have no heritage significance.

Farm 351 (Remainder) was part of an older farm (SG 221/1832) but this portion was sub-divided in 1965 and does not contain a house.



Plate 6: Farm house at Windheuwel

Plate 7: Graveyard at Windheuwel.

Windheuwel A (Farm 354) was originally part of a much larger farm, also called Windheuwel, but this particular section was sub-divided in 1949 (SG 9447/49). There is a house and two sheds on this portion of the farm, as well as a graveyard. One of the sheds is partially clad in corrugated iron. The farmhouse may have an older core but has been completely renovated (Plate 6). Of interest is the overgrown graveyard (Plate 7) which contains at least one headstone erected in 1896.

Langhoogte 357 (Remainder and Portion 2) was surveyed in 1839 (SG 662/1839) but there is reference to an older Freehold dating back to 1817. The house does not appear to be older than 60 years (Plate 8) and there is a graveyard nearby (Plate 9).

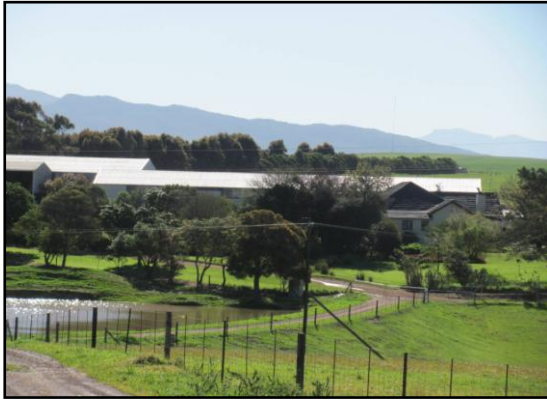


Plate 8: Langhoogte farmhouse to the right and in front of the sheds; **Plate 9:** Langhoogte graveyard.

Keissies Kraal 350 (Remainder and Portion 2) surveyed in 1832 (SG 232/1832) and the semi-circular shape of the property suggests that it was originally part of a larger, loan farm. Portion 2, known as De Vlei, contains a farm house and shed (Plate 10).



Plate 10: De Vlei farmhouse

Plate 11: Langhoogte A farmhouse

Langhoogte Annex 362 (Portion 1) was surveyed in 1935 (SG 1674/1939). The house may have an older core (Plate 11) but has been substantially renovated.

Farm 791 (Remainder) was surveyed in 1985 (SG 2691/1985) and contains no buildings.

None of these farm houses have any features of historical significance and none are directly impacted by the proposed development.

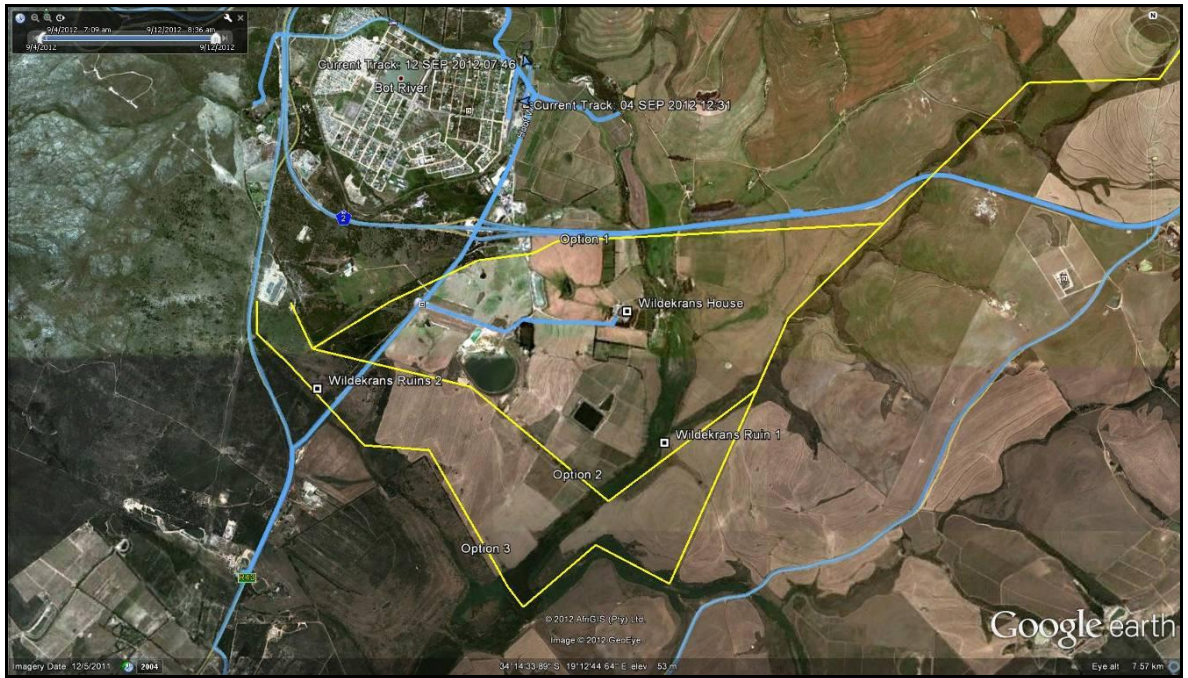


Figure 5: The three southern powerline alternatives (Options 1-3) are shown as yellow lines. The blue lines indicate the tracks recorded during the survey.

There are ruined structures on the farm Wildekrans (Farm 820/6 and Farm 820/7) which may be impacted by the proposed construction of the 132kV line (Figure 5). These ruins were not visited and their archaeological/historical significance was not assessed. Two of the southern options will be located in proximity to the ruins but neither threatens the ruins directly.

There are no Built Environment issues with regard to the four options for the 132kV overhead powerlines.

4 IMPACTS IDENTIFICATION AND ASSESSMENT

4.1 Introduction

This section identifies the potential impact of the proposed facility on the heritage issues discussed above.

4.2 Identification of Impacts

The impacts to Palaeontology, Archaeology and Visual are considered in detail in the specialist reports appended as Appendices 1, 2 & 3.

4.2.1 Construction phase

The destruction of tangible heritage (built environment, archaeological sites, fossils) almost always takes place during the construction process of development activities rather than during the operational phases as the main source of impact to heritage is due to the disturbance of undisturbed ground or landscape and/or demolition of structures and places protected by the NHRA and/or valued by a community. Invariably the kinds of impacts resulting are irreversible, irreplaceable and of permanent duration as heritage resources are finite.

Palaeontological material is destroyed by bulk earthmoving, cutting and mining operations, however palaeontological resources tend to be extensive (depending on the resource) and are rather more resistant to impact than archaeological material for the simple reason is that there is more of it. Because palaeontological material is often very deeply buried, scientists often rely on human intervention in the land surface to collect data. In short, provided that palaeontologists can use the opportunity arising from major construction works to adequately sample and record profiles and exposed material as part of the environmental management process, a potential negative impact can be transformed into a positive opportunity to increase the levels of knowledge about a locality and the species of fauna and flora that were present in the past.

Archaeological sites and graves are highly fragile and context sensitive, which means that their value is very easily destroyed when the landscape in which they are situated is disturbed by bulk excavations and infrastructural development.

Cultural landscapes are highly sensitive to accumulative impacts and large scale development activities such as wind energy facilities may change the character and public memory of a place. In terms of the NHRA a cultural landscape may also include a natural landscape of high rarity value and scientific significance.

4.2.2 Operational phase

During the operational phase of the facility, it is expected that impacts will be largely neutral. It is expected that any significant changes will independently trigger EIAs or HIAs.

4.2.3 Decommissioning phase

It is anticipated that the facility will be decommissioned after 20 years. Heritage impacts can occur during the decommissioning phases of large operations. The process of rehabilitation can involve surface disturbance and earthmoving operations. These impacts would be of a similar nature to those experienced during the construction phase.

4.2.4 Cumulative Impacts

In the case of Langhoogte, this is a key issue for consideration. There are currently three other WEFs proposed in the immediate area:

- Caledon WEF (37 turbines). The EIA application has been submitted to DEA but no authorisation has yet been issued. The original WEF application was for 54 turbines, but this has since been downsized to 37. The proponent is Caledon Wind Trading.
- Dassiesfontein WEF (6 turbines). EIA authorisation obtained.
- Klipheuwel WEF (10 turbines). EIA authorisation obtained.

The Dassiesfontein WEF and Klipheuwel WEF were handled as one application and EIA authorisation was obtained on the 27 June 2011. The proponent is Biotherm.

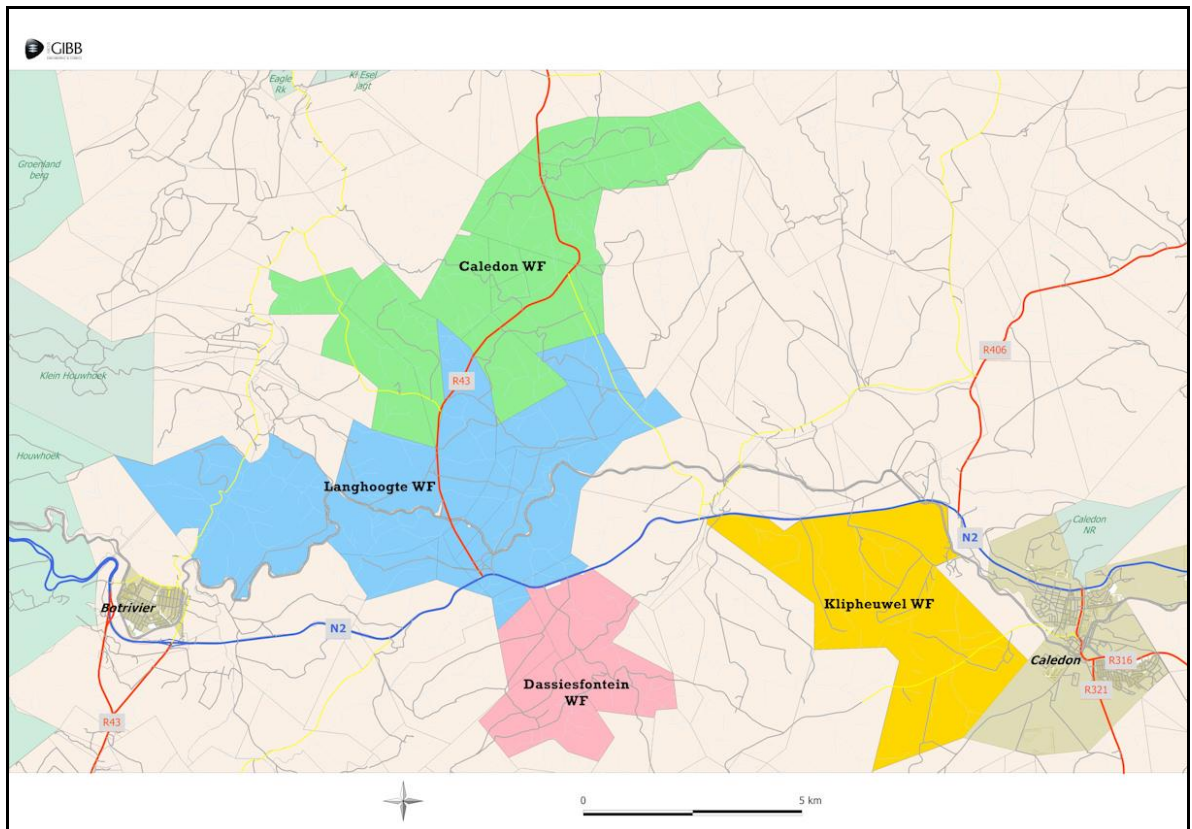


Figure 6: The position of the Klipheuwel, Caledon and Dassiesfontein wind energy facilities with respect to the Langhoogte WEF.

At least three other alternative energy developments have been proposed for the Botrivier – Caledon region. Since the bedrocks in this region are generally of low to very low palaeontological sensitivity, the cumulative impact of the proposed developments on fossil heritage is considered to be of low significance.

Similarly, the significance of archaeological sites in the Langhoogte wind energy facility is low, and the cumulative impact of three additional wind farms is likely to be low.

Since the wind turbines will not impact directly on the Built Environment or Graveyards, the cumulative impact is likely to be restricted to a visual impact.

4.3 Potential Mitigation Measures

Generally, with regard to Palaeontology and Archaeology, mitigation can be achieved through scientific recording, sampling or excavation of heritage material. Palaeontologists and Archaeologists aim to sample the heritage resources so that a portion of the find is conserved in perpetuity. The process is slow, exacting and expensive. The end result is always the loss of the heritage site as a permanent heritage resource; the gain is the rescue of knowledge provided that the sampling is done in according to suitable standards.

With respect to the Langhoogte Wind Energy facility, the following mitigation measures are proposed:

- The Palaeontological specialist report (Appendix 1) has identified no impacts to the palaeontological heritage of the area and therefore no mitigation is required;
- The Archaeological specialist report (Appendix 2) predicts that scatters of Early Stone Age implements will be found in ploughed lands but they are of low significance and no mitigation is required;
- The Middle Stone Age and Later Stone Age sites on a small rocky hill behind De Vlei homestead are not threatened by the proposed development and no mitigation is required;
- There are no buildings which will be demolished during the construction of the wind farm. A Buffer of 400m has been implemented around each farm complex. The mitigation of potential impact would involve the maintenance of buffers around farm buildings;
- There are no graveyards which will be destroyed during the proposed construction of the wind farm. If any unmarked graves are uncovered during development, work should stop in that area and Heritage Western Cape should be notified;
- With respect to the 132kV power line alternatives, it is recommended that spot checks are undertaken once the final power line option has been selected, to ensure that heritage resources are not negatively impacted.

4.4 Impact Assessment Methodology

The potential impacts of the proposed development have been evaluated according to the criteria recommended during this EIA process. Low significance ratings have been allocated to Palaeontological and Archaeological resources and the Built Environment. The only heritage resources which are considered to be of high significance (Grade 1) are graveyards. The potential impacts of the development on irreplaceable heritage resources are considered very low.

4.5 Impact Assessment – Proposed Development

The impact of particularly the construction of the wind energy facility may result in the physical destruction of heritage resources or in the displacement of heritage resources so that they lose their context, and thereby their value.

4.5.1 Construction phase

<i>Impact</i>	<i>Nature</i>	<i>Extent</i>	<i>Duration</i>	<i>Intensity</i>	<i>Reversibility</i>	<i>Impact on Irreplaceable Resources</i>	<i>Consequence</i>	<i>Probability</i>	<i>Significance</i>	<i>Confidence</i>
Impact 1: Palaeontology (See Appendix 1)										
Impact Description: The developments may adversely affect potential fossil heritage within the study area by destroying, disturbing or permanently sealing-in fossils that are then no longer available for scientific research or other public good.										
Without Mitigation	-	Local	Permanent	Low	High	Low	Low	Probable	Low	High
Mitigation Description: Sampling of fossil bearing deposits Indicate if mitigation is possible: No mitigation is required										
With Mitigation	-	Local	Permanent	Negligible	High	Low	Low	Improbable	Low	High
Cumulative Impact: The cumulative impact of the proposed developments on palaeontological heritage is therefore considered to be of low significance Description of impact and significance: Low										
Impact 2: Archaeology (See Appendix 2)										
Impact Description: The construction of turbines, underground cabling and access roads will result in scatters of ESA stone implements being moved from their position. This may potentially result in loss of information. It may also result in indirect impacts on Sites 003, 004 & 005 which are located in proximity to an access road and underground cabling to Turbine 10.										
Without Mitigation	-	Low	Permanent	Low	High	Low	Low	Medium	Low	High
Mitigation Description: No mitigation is required as there is no evidence that ESA stone artefacts are in their original context and that collections would result in the generation of new information. With regard Sites 003, 004 & 005 – it is recommended that spot checks are done by an archaeologist during the construction phase to ensure that no remains are damaged by the access road and underground cabling. Indicate if mitigation is possible: Mitigation would include the collection of stone tools for statistical analysis or the excavations of archaeological stone tool scatters. However, there is no reason to support this. Mitigation with regards Sites 003, 004 & 005 would involve some spot checks by an archaeologist during construction of the access roads around the hill.										
With Mitigation	-	Local	Permanent	Negligible	High	Low	Low	Improbable	Low	High
Cumulative Impact: The impact of the proposed developments on the archaeology of the area is considered to be of low significance. Description of impact and significance: Potential loss of information. However, the significance of the stone tool scatters is low.										
Impact 3: Built Environment and Graves (this report)										
Impact Description: The potential destruction of historic buildings and/or graveyards during the construction of the wind farm.										
Without Mitigation	-	Local	Permanent	Low	High	Low	Low	Probable	Low for buildings, high for graveyards	High
Mitigation Description: Ensure that there is a buffer of at least 400m around all buildings and graveyards. If graves are uncovered during construction, work should stop in that area and HWC should be notified. Indicate if mitigation is possible: Yes, maintain buffer around buildings. Notify HWC if heritage remains are uncovered.										
With Mitigation	-	Local	Permanent	Low	High	Low	Low	Probable	Low for buildings, high for graveyards	High
Cumulative Impact: The cumulative impact of four wind farms between Bot River and Caledon may have a negative visual impact on the Built Environment, but there will be no direct damage or destruction of buildings. This also applies to graveyards. Description of impact and significance: There will be no direct impact.										

4.5.2 Operational phase

The impacts will not change for the Operational or Decommissioning Phase of the wind farm. Once the infrastructure related to the wind farm has been removed, the *status quo* will return.

4.5.3 Decommissioning Phase

The impacts will not change for the Operational or Decommissioning Phase of the wind farm. Once the infrastructure related to the wind farm has been removed, the *status quo* will return.

4.6 Impact Assessment - Alternatives

4.6.1 No Go Option

If the wind energy facility is not constructed, the status quo will remain. There will be no impact on potential palaeontological resources. The stone artefacts in agricultural fields which are currently disturbed by ploughing will continue to be disturbed. Archaeological sites which are “protected”, as they are located on rocky koppies and along streams, and which are not ploughed will continue to be conserved. There will be no potential disturbance of historical archaeological material near old farm buildings.

There will be no impact on the Built Environment or on graveyards. The status quo will be retained.

4.6.2 Alternative Powerline Routing

It should be pointed out that a 132kV power line is unlikely to have a high visual impact from a heritage perspective as the pylon consists of a single 24m high, steel tower and the footprint is also of limited size (see Plate 1).

A single 132kV line is required to take the generated power from the sub-station on site, to the Houhoek substation where it can be re-distributed. Two alternative routes, a northern route and a southern route, have been proposed. There are three sub-routes for the southern alternative, all to the south of the N2. These are named as Options 1, 2 or 3 (Figure 5). The following negative heritage issues have been identified with respect to the southern route:

- All three routes would have to cross the scenic N2;
- Option 1 runs parallel and next to the scenic N2 resulting in a visual intrusion on the landscape;
- Option 2 will pass close to Wildekrans Ruins 1 (Figure 4) and will be a visual intrusion for the occupants of the Wildekrans homestead;
- Option 3 will pass close to Wildekrans Ruins 2.

Of the three southern options, Option 3 has the least impact on the heritage of the area and while it is the preferred alternative from a Heritage perspective, any of the three southern sub-routes are acceptable.

It is recommended that spot checks are done of proposed pylon locations, once the final power line route has been determined, to ensure that no significant archaeological/heritage remains are impacted.

5 MONITORING PROGRAMME

5.1 Palaeontology

The environmental officer responsible for the Langhoogte wind farm development should be alerted to the possibility of fossil remains being found on the surface or exposed by fresh excavations during construction. Should substantial fossil remains be discovered or exposed during development, the responsible environmental officer should alert Heritage Western Cape so that appropriate mitigation measures may be considered. These measures would normally involve the recording and judicious sampling of fossil material by a professional palaeontologist at the developer's expense. The specialist involved would require a collection permit from SAHRA, fossil material must be curated in an approved repository, and all work carried out should meet the minimum standards for palaeontological impacts developed by SAHRA. Mitigation in the form of fossil recording and collection should have a *positive* impact on our appreciation of local fossil heritage.

5.2 Archaeology

In view of the low significance rating ascribed to the pre-colonial archaeological material identified in the study area, no monitoring by an archaeologist is required during the construction phase. Middle and Later Stone Age sites were found on a little rocky hill behind De Vlei farmstead but they are not threatened by the construction of the wind farm and no mitigation or monitoring is required.

The potential impact of the four alternative 132kV powerline routes on the archaeology of the area is considered to be low. No preference is expressed, in terms of archaeology, for any of the routes. It is recommended that spot checks are done of proposed pylon locations, once the final power line route has been determined, to ensure that no significant archaeological/heritage remains are destroyed.

5.3 Built Environment and Graves

A buffer of 400m should be maintained around farmsteads to ensure that no buried historic material is destroyed. If any historical material is uncovered during the construction phase of the development it should be reported to Heritage Western Cape. No graveyards are threatened by the development. However, should human remains be uncovered during the construction of the wind farm, then work should stop and Heritage Western Cape should be notified.

If human remains are accidentally uncovered:

- Leave remains in place, do not remove anything;
- Cordon off the area;
- Notify the archaeologist at Heritage Western Cape;
- Contact an archaeologist who will indicate whether to inform the SA Police Services;
- If exhumation is required, a permit will have to be obtained from the SAHRA Burials Unit.

5.4 Cultural Landscape and Scenic Routes (Visual)

The Cultural Landscape and Scenic Routes are addressed in Appendix 3.

The finding is that the medium density and tall scale of the wind turbine towers in the landscape will have a high impact on the views from within and towards the site. The assessment method used shows the significance of the visual impact as medium which means that according to the assessment criteria the visual aspect and the mitigation measures will require consideration in the decision making.

The high visual intrusion zones of views are recognised to be within 500m of roads, homesteads and sensitive land uses. A buffer of 350m along the R43 has been proposed for the local road and 500m for National Roads. The positions of wind turbines reflect this spacing as shown on the Analysis maps Figure 4 &5 of Appendix 3.

6 CONCLUSION

This HIA integrates the findings of the Archaeological, Palaeontological and Visual studies. Although not specifically requested, it takes cognizance of the Built Environment and Cultural Landscape where this is appropriate.

As a result of the HIA process, the following recommendations were made:

Palaeontology

- The effective paleontological sensitivity of the Table Mountain Group, Bokkeveld Group and younger sedimentary rocks in the study area is very low. There are no recommendations for specialist palaeontological mitigation or further studies for this project. It is recommended that the ECO responsible for the Langhoogte wind farm development should be alerted to the possibility of fossil remains during construction.

Archaeology

- Early Stone Age archaeological material is widespread in agricultural lands between Botrivier and Caledon and is generally considered of low significance. Middle and Later Stone Age sites were found on a little rocky hill behind De Vlei farmstead but they are not directly threatened by the development. Spot checks by an archaeologist of the access roads to Turbine 10 are proposed. A Later Stone Age lower grindstone was recovered from the edge of a ploughed land. No mitigation is required with respect to pre-colonial archaeology;
- No historical archaeological material was recovered. Generally, a historic archaeological signature is concentrated around farmsteads and their immediate environs. A buffer of 400m should be maintained around farmsteads to ensure that no buried historic material is destroyed. If any historical material is uncovered during the construction phase of the development it should be reported to Heritage Western Cape.

The overall impact significance of the proposed Langhoogte wind farm project on archaeological resources is consequently assessed as low (*negative*).

Built Environment and Graves

- The historic farmstead of Boontjieskraal, which is considered to be of potential Grade 2 significance by Heritage Western Cape, is located some 2.5km to the south-east of the closest turbine position outside the study area;
- The historic farmstead of Compagnies Drift (now known as Beaumont Estates) which is of Grade 3A significance is located 2.6 km to the south-west of the closest turbine, outside the study area. The proposed facility will not be visible from the farmstead;
- There are farm graveyards on Langhoogte and Klipheuwel, near the farm buildings. No graveyards are threatened by the development. However, should human remains be uncovered during the construction of the wind farm, then work should stop and Heritage Western Cape should be notified;
- None of the farm houses in the study area are of historic significance. There are no buildings which will be demolished during the construction of the wind farm. A Buffer of 400m has been implemented around each farm complex. The mitigation of potential impact would involve the maintenance of buffers around farm buildings;

Cumulative Impact

At least three other wind energy facilities have been proposed for the Botrivier – Caledon region. At least three other wind energy facilities have been proposed for the Botrivier –

Caledon region, namely the Caledon WEF with 37 turbines, the Dassiesfontein WEF with 6 turbines and the Klipheuwel WEF with 10 turbines. The latter two wind farms have been handled as one application and EIA authorisation has been obtained. The Caledon WEF awaits EIA authorisation.

Since the bedrocks in this region are generally of low to very low palaeontological sensitivity, the cumulative impact of the proposed developments on fossil heritage is considered to be of low significance. Similarly, the cumulative impact of the proposed wind farm on the archaeological heritage is of low significance.

Powerline Alternatives

The electricity generated by the wind farm will be fed into the existing Houhoek sub-station at Bot River via a 132kV powerline, carried on a 24m high monopole. A Northern and Southern alternative have been proposed with three sub-routes for the southern alternative.

- The northern route crosses the Van der Stel Pass resulting in high visual impact and there are engineering complexities with crossing the N2 on the Houwhoek Pass;
- The Southern route (preferred route): is SAGIT's preferred route. Three possible sub-routes are proposed and assessed as alternatives. It is proposed to run as close as possible to the existing 66kV Eskom line. Eskom have confirmed that they will expand their current network distribution between the Houhoek substation and Caledon in the future and the expansion will take the form of a new double circuit 132kV line.

The impact significance of the proposed new 132 kV transmission line between the new on-site substation and the existing Botrivier substation on the palaeontology and archaeology of the area is considered to be low. No preference is expressed for any of the routes.

It is recommended that spot checks are done of proposed pylon locations, once the final power line route has been determined, to ensure that no significant archaeological/heritage remains are impacted.

Visual Impact (Bapela Cave Klapwijk cc)

The site analysis considered the suitable areas for turbine location and reviewed this in the context of the 2006 Strategic Assessment by the Provincial Government of the Western Cape and the 2010 Regional Site Assessment Study by the Theewaterskloof Municipality. The buffers recommended in these documents were applied to the Site,

The site area is visually exposed and the agricultural character and sense of place are particular to the rolling topography and the pattern of the contoured lands. The site's elevated position provides distant views in most directions which regarded as highly scenic. These changing views are presented from the N2 and R43 roads that are adjacent and through the site thereby affording many the pleasure of the scenic landscape.

On the matter of the assessment of the visual impacts the construction and the decommissioning phases are primary impacts, of short duration and are easily mitigated and therefore have low significance of impact. However it is the operational phase that will have the significant visual impacts on visual quality, landscape character of the setting and sense of place of the area.

While the turbines do not block the view they add a vertical element that still allows distant vistas to be appreciated.

The high visual intrusion zones of views are recognised to be within 500 m of roads, homesteads and sensitive land uses and 400m has been applied as this complies with noise and international standards.

The finding is that the medium density and scale of the wind turbine towers in the landscape will have an intrusion on the views from within and towards the site. The assessment method shows the significance of this intrusion as medium which means that according to the assessment criteria the visual aspect and the mitigation measures will require consideration in the decision making.

The aspect of shadow flicker caused by the rotating blade's shadow over ground, structures and trees was researched and the conclusion is that it has no risk to health but that where problems exist these can be mitigated by shut down of the turbine for certain periods. This phenomena is considered to be of low impact and low significance by correct positioning as a mitigation measure.

The night scene will be altered by the double red light on the top of the turbine housing(Nacelle). This is not considered a high visual impact although the area of the site will be more visible from further. The lights will be the same and have similar intensity as those on tall masts or towers.

This visual intrusion or impact will not alter the night scene significantly but the matter will require consideration in decision making

The northern edge of Botrivier town is approximately 3.5km from the nearest wind turbine and therefore will not be intrusive in views in that direction. As the Integrated Development Plan for Botrivier 2012 – 2017 states that expansion of the town will take place to the south, there will be no increase in visual intrusion by the proposed wind energy facility in the future.

The cumulative visual impact of the three proposed wind energy facilities in the Botrivier view shed will be also be seen from the N2 and the R43 and will cause a significant change to the local visual character of the area. However this will be the case only if all of the facilities are approved for construction after the bid process is completed.

Considering that the required mitigation regarding turbine size, micrositing, and WEF density have already been built into the proposal, the mitigation of the visual impact of such tall animated structures in a scenic setting is confined to cosmetic methods. The reduction of the visual scale can be achieved at close range, 100 to 300m by painting vertical broad stripes of 4 shades of green with the off white or grey of the tower between each stripe. This is to be done to a height of 6 metres and will visually fuse the base with the landscape. This aspect does not conflict with the Civil Aviation marking specifications outside aerodrome²⁵.

In conclusion while the wind turbines have high visual intrusion in views from roads and homesteads the significance is medium with mitigation in place. This rating requires that the visual aspects must be considered in the decision process because of the scenic nature of the setting and the landscape.

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**APPENDIX 1: PALAEOLOGY SPECIALIST STUDY ENVIRONMENTAL
IMPACT ASSESSMENT FOR THE ESTABLISHMENT OF THE LANGHOOGTE
WIND FARM, WESTERN CAPE PROVINCE BY DR JOHN ALMOND**

**APPENDIX 2: ENVIRONMENTAL IMPACT ASSESSMENT FOR THE
ESTABLISHMENT OF THE LANGHOOGTE WIND FARM, WESTERN CAPE:
ARCHAEOLOGICAL IMPACT ASSESSMENT By Lita Webley & David Halkett**

**APPENDIX 3: ENVIRONMENTAL IMPACT ASSESSMENT FOR THE
ESTABLISHMENT OF THE LANGHOOGTE WIND FARM, WESTERN CAPE:
VISUAL IMPACT ASSESSMENT BY ALAN CAVE**