Environmental Impact Assessment for the proposed Banna Ba Pifhu Wind Energy Project near Humansdorp, Eastern Cape: Final Environmental Impact Assessment Report

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CHAPTER 15. CONCLUSIONS

15.1 INTRODUCTION

The scale of the Banna Ba Pifhu wind energy project has been reduced from 50 MW to 30.6 MW. Both the 50 MW and 30.6 MW alternative layouts are assessed in the Final EIA report, with 50 MW being alternative 1 with a maximum of 28 turbines, and 30.6 MW being the preferred alternative with a minimum of 9 and a maximum of 17 turbines (the actual number will be dependent on the capacity of the turbines selected in the range between 1.8 and 3.2 MW).

This section presents the conclusion on the most significant impacts identified through the EIA process; together with the management actions required to avoid or mitigate the negative impacts, or to enhance the positive benefits. It also provides an overview of the alternatives that were assessed, the cumulative impacts and includes an overall evaluation of the Environmental Assessment Practitioner.

The assessment of impacts is presented in the following sections:
- Impact on Terrestrial Flora and Fauna;
- Impact on Birds;
- Impact on Bats;
- Visual Impact;
- Noise Impact;
- Economic Impact;
- Impact on Archaeology;
- Impact on Palaeontology;
- Impact on Wetlands and Aquatic systems
- Impact on Agricultural soil potential

For each of above impacts, specialist studies were conducted, the results of which are presented in Chapters 5 to 14 of this Final EIA Report.

15.2 IMPACT ON TERRESTRIAL FLORA AND FAUNA

Flora

Mucina & Rutherford classify vegetation units present within the wind farm sites as Humansdorp Shale Renosterveld (Endangered), Gamtoos Thicket (Least threatened) and Loerie Conglomerate Fynbos (Least threatened). Most of the wind farm infrastructure will occur in areas that are transformed cultivated pastures, thus minimising the overall impact to natural vegetation. Areas with an elevated vulnerability (moderate to high) include intact Humansdorp Shale Renosterveld, seeps, drainage lines and wetlands and thicket habitat on slopes. Sixteen terrestrial vegetation impacts that may occur during the construction and operational phases of the proposed project have been indentified, which can be divided into three key types of impacts, namely:

- Loss of species of special concern (SSC) and SSC habitat;
- Loss of vegetation habitat; and
- Reduction or changes to ecological processes and functioning. This include temporary fragmentation of habitats, increased risk of alien invasion in drainage lines and disturbed areas, changes in natural fire regime and overall reduction of ecosystem functioning.

Assessment rating

The significance of impacts on wetland and riparian vegetation is **medium after mitigation.**

The overall impacts on terrestrial flora are estimated to be **negative** and of **medium** to **low significance (after mitigation).**

The Alternative 1 layout comprising 50 MW was also assessed. The preferred alternative 30.6 MW wind farm option will have a lower overall impact on vegetation and flora compared to the alternative 1 layout of 50 MW.

Mitigation

- Protected flora or species of special concern must be removed from the development footprint to be safeguarded from destruction and relocated either to undeveloped areas or off-site in consultation with conservation authorities and relevant botanical specialists;
- Permission must be obtained from the provincial authorities to destroy or remove any protected plant species as per legislation;
- A long term alien plant management plan to control these invasive species must be implemented within the designated Open Space areas;
- Appropriate measures must be implemented where infrastructure crosses drainage lines or seeps and no turbine footprints or lay down areas will be sited within recommended wetland and riparian buffers;
- Kikuyu grass must not be utilised during re-grassing of verges, turbine footprints and other landscaped areas within the site, particularly adjacent to riparian habitat;
- An Environmental Control Officer (ECO)/Environmental Site officer (ESO) must be appointed to oversee the Environmental Management Plan and relocation of the Species of Special Concern before construction commences.
- A long-term alien plant management plan to control invasive plant species must be implemented within the designated Open Space areas, especially along access road verges.

Fauna

Five key faunal impacts have been identified and assessed, namely:

- Habitat destruction may affect faunal diversity and composition;
- Road mortality from trucks and other service vehicles;
- Poaching(mammals);

- Fauna harmed by fences (mammals/reptiles); and
- Corridor disruptions as a result of habitat fragmentation.

The species that will be mostly affected during the construction phase of this project are those that can't vacate the affected area themselves, e.g. tortoises, burrowing reptiles and burrowing mammals. These species can suffer direct mortality during construction activities. Traffic on the access roads to and from the construction sites would most likely result in road kills, including possible amphibian migrations during rainy periods. As indicated, some species of special concern are found in the area and will be affected by this development. All amphibians are of least concern and are well protected elsewhere. The reptiles of special concern are the FitzSimons long-tailed Seps and the Elandsberg Dwarf Chameleon. Although these species are well protected elsewhere (e.g. in the Lady Slipper Nature Reserve), their known distribution is limited. The likelihood of them being significantly affected by the proposed development is however low. The impact on the terrestrial fauna will largely be temporary and is expected to return to its normal state after construction, other than road mortalities, the risk of which are likely to persist.

Assessment rating

- Significance of impacts on fauna harmed by fences (mammals/reptiles) is **medium after mitigation**; and
- Significance of impacts on amphibians as corridors are disrupted as a result of habitat fragmentation is **medium after mitigation**.

Overall the impacts on terrestrial fauna are estimated to be **negative** and of **medium** to **low significance (after mitigation).**

The Alternative 1 layout comprising 50 MW was also assessed. The preferred alternative 30.6 MW wind farm option will have a lower overall impact on fauna compared to the alternative 1 layout of 50 MW.

Mitigation

- Removal of animals from the affected areas before the start of site clearing and construction, and relocating these to safe areas would only be a valid mitigation option in the case of tortoises, so far as reasonable possible. All other reptile and small mammal species are extremely difficult to catch and it would be futile to attempt to relocate them. Before site clearing, affected areas should be thoroughly searched for tortoises. Tortoises found must be released in adjacent unaffected areas;
- Appropriate speed control measures must be implemented to keep vehicular traffic speeds within recommended limits;
- Road design must be such that it allows free movement of fauna;
- All staff active on site must be instructed and briefed regarding the strict faunal management requirements before construction commences; and
- Any fencing must be kept to minimum and recommended measures implemented to minimise risk of impacts to fauna.

15.3 IMPACT ON BIRDS

The main potential impacts of the project on birds are:

- Mortality due to collision with the wind turbines;
- Displacement due to disturbance;
- Habitat loss due to the footprint of the wind farm; and
- Mortalities due to collision with associated power line infrastructure.

Although this is a relatively small wind farm site, it is not without intrinsic value for priority avifauna from a foraging, roosting and breeding perspective. The combination of pastures, wetlands and scrub is particularly well suited for Denham's Bustard, Blue Crane, White-bellied Korhaan, Black-winged Lapwing and Amur Falcon, as is the whole of the Jeffreys Bay, Humansdorp and Oyster Bay agricultural districts. Displacement of some priority species is possible, particularly Denham's Bustard, but at this stage, with no wind farms having been constructed as yet in the area, it is not possible to test the validity of this statement. However, should this impact materialise, the cumulative effect of displacement of particularly Denham's Bustard (and possibly White-bellied Korhaan) might have regional or even national implications, depending on the number of wind farms that gets to be developed in the region, and the level of displacement. A proposal for an avifaunal habitat assessment for the Kouga Municipal Area has been submitted to the applicant and two other wind energy developers by the bird specialist, Chris van Rooyen on behalf of the Kromme Trust. All three developers have agreed in principal to support the initiative. The objective of the assessment would be to delineate areas of sensitive habitat to assess the potential cumulative displacement impact of wind farm developments. As far as the risk of mortality due to collisions is concerned, with the data currently available, it would seem that soaring species, and particularly Amur Falcons, might potentially be most exposed to this impact and Blue Cranes to a lesser extent. Implementation of the proposed mitigation measures should reduce some of the envisaged impacts from medium to low, but while some impacts are low to start with, for others, very little practical mitigation is possible. It is proposed to connect the wind farm substation to the existing 66 kV Melkhout / St. Francis overhead power line, which passes through the site. Currently two alternative alignments have been identified, but the connection points still need to be confirmed by Eskom. Irrespective of where the alignment is planned, it will need to be mitigated because of the high density of power line collision sensitive species, particularly Blue Crane and Denham's Bustard, on the site.

Pre-construction bird monitoring was undertaken at the proposed turbine site by two experienced bird monitors under the guidance of the bird specialist, Chris van Rooyen. The monitoring commenced in March 2011 and continued until April 2012. The monitoring was done over four sampling periods, i.e. summer, winter/early spring, late spring and autumn. The specific objectives of the monitoring programme were to record the abundance and diversity of all birds, and flight patterns of priority species. The results from the pre-construction monitoring programme and the proposed mitigation measures based on the monitoring are included in the updated Bird specialist study (Chapter 6 of the Final EIA Report).

Assessment rating

- As far as collision mortality is concerned, it is predicted that the project will have a **negative** impact of **Low significance (with mitigation).** This will have to be verified by post-construction monitoring.
- As far as displacement of birds is concerned, no firm conclusions can be drawn without actual post construction monitoring. Priority species likely to be affected include Amur Falcon, Korhaans, Blue Cranes and bustards. It is predicted that the project will have **a negative** impact of **High to Medium significance (with mitigation) during construction** and **Medium to Low significance (with mitigation) during operation**, depending on whether habituation takes place, or off-set compensation is implemented.

As far as turbine layout alternatives are concerned, the preferred alternative (comprising 30.6 MW) is preferred from a potential bird impact perspective. The preferred alternative contains 30% fewer turbines compared to the alternative 1 layout of 50 MW, therefore the collision risk should be significantly less.

Mitigation

- The dataset must be analysed in order to establish the statistical significance of potential trends that have been identified so far (e.g. the influence of wind direction and wind strength). This will assist in the formulation of the final recommendations;
- Access to the remainder of the site should be strictly controlled in order to minimise potential disturbance of sensitive priority species, particularly Denham's Bustard, both during the construction phase and the operational phase;
- Post-construction monitoring should be implemented to assess the impact of displacement, particularly on priority species. Initially, a 12 month period of post-construction monitoring should be implemented, using the same protocol as is currently implemented. Thereafter, the frequency for further monitoring will be informed by the results of the initial 12-month period;
- Should the results of the post-construction monitoring indicate significant displacement of priority species, appropriate off-set compensation should be negotiated with the developer to compensate for the loss of priority species habitat;
- The proposed 66kV power line should be marked with Bird Flight Diverters (BFDs) to lower the risk of avian collisions with the power line;
- Once the turbines have been constructed, post-construction monitoring as per the latest version of the Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa (Jenkins et al. 2011) should be implemented to assess actual collision rates. If actual collision rates indicate high mortality levels, mitigation measures such as halting operation of specific turbines during high risk conditions, or reducing rotor speed, to reduce the risk of collision mortality should be considered.

15.4 IMPACT ON BATS

Natural Scientific Services was commissioned by WKN Windcurrent to conduct a 12 month pre-construction bat monitoring survey at the Banna Ba Pifhu site. The bat study includes the findings of the first quarter of the twelve month preconstruction bat monitoring programme. NSS will generate a final bat monitoring report in May 2013. This chapter is therefore not the final bat monitoring report and NSS reserves the right to make changes to the findings, impact assessment and sensitivity mapping at the completion of the twelve months of monitoring. The final monitoring results and any updates in the findings and sensitivity mapping will be included in the project draft EMPr as part of the detailed design phase.

The following impacts are possible for the site:

- Bat roost disturbance and/or destruction due to construction activities;
- Fragmentation to and displacement from foraging habitat due to wind turbine construction and operation;
- Bat fatalities due to collision or barotrauma during foraging activity and during migration;
- Bat fatalities due to collision or barotrauma due to attraction of bats to towers for roosting or out of curiosity; and
- Bat fatalities due to electrocution from overhead power lines.

Cumulatively, the above impacts could lead to loss of Conservation Important bat species and bats providing important ecosystem services from the area due to construction and operation activities

From the acoustic monitoring data collected thus far the following is evident:

- The Banna Ba Pifhu site is considered to have a relatively high bat activity index for the Southern Cape region. Compared to another site similarly located, the site is considered to be similar and slightly higher bat activity levels were recorded;
- *Miniopterus natalensis,* a Conservation Important species, has been confirmed to utilise the proposed site.
- 91% of all bat activity occurs between 17:30 and 19:30 in the evening; and
- The Banna Ba Pifhu site is so far considered to be of **Medium Risk** to bats where operational mitigation measures will be required to ensure that bats utilising the site are not significantly impacted on.

Assessment rating

- The significance of roost disturbance during construction is rated as **negative and Medium (before mitigation) and Very Low (after mitigation)**;
- The significance of fragmentation of foraging habitat during construction is rated as **negative and Medium (before mitigation) and Low (after mitigation)**;
- The significance of bat fatalities due to collision or barotrauma during foraging activity is **negative and High (before mitigation) and Low (after mitigation)**;

- The significance of bat fatalities due to collision or barotrauma during migration is **negative and High (before mitigation) and Low (after mitigation**) with a low confidence until monitoring is complete;
- The significance of the loss of conservation important bat species from the area due to construction activities is **negative and Medium before and after mitigation**;
- The significance of the loss of conservation important bat species from the area due to the operation activities are **negative and High (before mitigation) and Medium (after mitigation)**; and
- The significance of losing bats providing ecosystem services is **negative and High (before mitigation) and Low (after mitigation)**.

The 50 MW alternative 1 layout was assessed in the bat specialist study prepared by Stefanie Dippenaar and was included in the Draft EIA Report (CSIR 2012). Based on the existing limited information available at the time and the findings of the site visit, the potential impact of the wind turbines on bats at the proposed Banna Ba Pifhu was anticipated to be **negative and of Medium significance with mitigation, and Medium – High without mitigation**. Ms Dippenaar stated that the overall confidence levels were low as only one month of monitoring data has been incorporated into the study and proposed that further pre-construction monitoring be undertaken. Additional pre-construction monitoring was undertaken by NSS and informed the revised bat study that is included in the Final EIA report.

Mitigation

- Identified roosting sites must be avoided during construction and recommended buffer zones must be adhered to;
- Should any new cave or tunnel roosts be discovered near to site, revised buffers must be placed on these systems;
- Keep all construction activities away from steep rocky slopes and distinct rock out crops;
- Avoid road and powerline crossings over rivers and gorges where possible;
- Minimizing the extent of the footprint area to be disturbed by pre-construction and construction activities at the turbine localities;
- The completion of the long-term bat monitoring is required for the preconstruction bat monitoring to be in line with Sowler and Stoffberg (2012) bat guidelines. Further construction and operational mitigation measures will be instituted when all seasons of bat activity have been recorded;
- Once pre-construction monitoring is complete, WKN will be required to implement operational mitigation measures, as will be specified in the final bat monitoring report, to reduce fatalities and negative impacts on local bat populations. This will most likely follow an adaptive mitigation approach that will adapt with the findings of the long-term post-construction monitoring continues; and
- Long-term post-construction monitoring must be conducted according to Sowler and Stoffberg's (2012) guidelines and should be conducted to monitor the effectiveness of the mitigation and residual bat impacts, in order to readjust mitigation measures.

15.5 VISUAL IMPACT

Visual or aesthetic impacts will occur during the construction, operational and decommissioning phases of the proposed project. The main visual impacts of the proposed WKN Windcurrent wind energy project are:

- Visual impact on the landscape character;
- Visual impact on sensitive viewers during construction and operation activities; and
- Visual impact of lightning of turbines on the landscape.

There are a number of sensitive visual receptors in the surrounding landscape that will be highly affected by the development of a wind farm on the proposed site. These include residents of the St Francis Marina, some of who value scenic views of the mountains to their north, residents of Kromme River holiday homes and resorts, visitors to Eastcot Private Nature Reserve and residents of surrounding farms who may currently have sea or mountain views which will be intruded upon by the proposed wind farm.

The wind farm will be introduced into a landscape composed of agricultural and coastal resort elements. Stock farming (dairy and beef) is the main agricultural activity, and this landscape character type is expected to have a low sensitivity to changes brought by a wind farm since the farming will not be affected. Coastal resorts are likely to have a low sensitivity to the wind farm development since most of them are growing rapidly and their attraction to tourists and holiday makers is more related to well-established coastal activities. Oyster Bay is likely to be more sensitive to a wind farm development as it is less accessible than the other towns and has a sense of remoteness which may be compromised by the wind farm. The coastal dune system near Oyster Bay is sensitive for the same reasons.

Assessment rating:

The summary of the visual impact is provided in Table 15.1

Table 15.1 Summary of visual impact criteria

Criteria	*Impact*
Viewer Sensitivity	Residents of settlements – Highly sensitive to changes in their views. Residents on surrounding farms – Highly sensitive to changes in their views. Scenic viewpoints and protected areas – Highly sensitive to the introduction of human-induced changes to views. Motorists – Low sensitivity due to short exposure time and the fact that their focus on landscape is reduced. Tourists will have more attention on the landscape and are seen as highly sensitive viewers.
Visibility of Development	**High** due to the tall structures and their position in the topography.
Visual Exposure	Residents of surrounding settlements – **high** for areas in Humansdorp, St Francis Bay, Paradise Beach and built-up areas along the Kromme River. Residents on surrounding farms – **high** visual exposure for a number of sensitive viewers living along the Kromme River, the R102 between Humansdorp and Jeffrey's Bay and on farms immediately surrounding the wind farm. Protected areas – **high** for areas in Eastcot PNR, Lombardini Game Farm and Seekoeirivier Nature Reserve. Motorists – **high** for sections of the R102 and R330.
Visual Intrusion	Residents of surrounding settlements – **moderate** for Humansdorp and Kruisfontein due to other elements in existing views. **High** for St Francis Marina and resorts along the Kromme River. **Moderate** for Paradise Beach since potential scenic views are unlikely to include the wind farm, and vegetation limits visibility. Residents on surrounding farms – **high** visual intrusion is expected for residents west of the wind farm site with high or moderate visual exposure since there are few man-made structures in existing views, and there are scenic views of the mountains and ocean which may be affected by the wind farm. Protected areas – **high** for Eastcot Private Nature Reserve since the wind farm is likely to be prominent in existing scenic views of the mountains to the north. **Low** for Seekoeirivier Nature Reserve due to distance from farm and other urban/resort elements in views, as well as positioning of wind farm outside scenic view potential. **Moderate** for Lombardini Game Farm due to proximity to the wind farm. Motorists – **High** for most of the R330 between Humansdorp and St Francis Bay.

The significance of the impact on the landscape character of the region is **high** since the impact duration is long, its extent regional and the intensity medium.

The significance of the visual impact on sensitive viewers during the construction phase of the wind farm is **high** due to the number of sensitive viewers who will be affected. Not all of the construction phase will necessarily have a negative visual impact since the construction of wind turbines is an incredible engineering feat and viewers are likely to find it fascinating to witness.

The overall significance of the visual impact on sensitive viewers during the operational phase of the wind farm is **high** due to the regional extent, long term and severe effect of the impact. The intensity of the impact is expected to be high for a number of highly sensitive viewers (residents) who will potentially be highly exposed to the wind farm, and since there are no structures of similar size in their existing views the visual intrusion will be high.

The significance of the impact of lighting of the turbines according to aviation regulations is expected to be **moderate** for residents living in close proximity, but **low** overall since it is unlikely to contribute to light pollution and there is an existing sky-glow produced by settlements and other developments in the region which will often be a backdrop to views of the lights.

The 50 MW (Alternative 1 Layout) was assessed in the visual specialist study that was included in the Draft EIA Report (CSIR 2012). The overall significance rating of visual impact has not changed for the new layout assessed in this report (Preferred Alternative Layout - 30.6 MW), but the new layout does take into consideration specific issues related to visual impact that I&APs raised after release of the draft report.

Mitigation

- Dust suppression is important as dust will raise the visibility of the development;
- New road construction should be minimised and existing roads should be used where possible;
- The contractor should maintain good housekeeping on site to avoid litter and minimise waste;
- Clearance of indigenous vegetation should be minimised and rehabilitation of cleared areas should start as soon as possible;
- Erosion risks should be assessed and minimised as erosion scarring can create areas of strong visual contrast with the surrounding vegetation, which can often be seen from long distances since they will be exposed against the hillslopes;
- Laydown areas and stockyards should be located in areas of low visibility (e.g. valleys between ridges) and existing vegetation should be used to screen them from views where possible;
- Night lighting of the construction sites should be minimised within requirements of safety and efficiency;
- Ensure that there are no wind turbines closer than 500 m to a residence;
- Maintenance of the turbines is important. A spinning rotor is perceived as being useful. If a rotor is stationary when the wind is blowing it is seen as not fulfilling its purpose and a negative impression is created (Gipe 1995);
- Signs near wind turbines should be avoided unless they serve to inform the public about wind turbines and their function. Advertising billboards should be avoided;

- According to the Aviation Act, 1962, Thirteenth Amendment of the Civil Aviation Regulations, 1997: "Wind turbines shall be painted bright white to provide maximum daytime conspicuousness. The colours grey, blue and darker shades of white should be avoided altogether. If such colours have been used, the wind turbines shall be supplemented with daytime lighting, as required;"and
- Lighting should be designed to minimise light pollution without compromising safety. Investigate using motion sensitive lights for security lighting. Turbines are to be lit according to Civil Aviation regulations.

15.6 NOISE IMPACT

The noise impact during the construction period will be localised around the turbine sites, as well as noise from construction vehicles accessing the sites. There will be a short term increase in noise in the vicinity of the site during the construction phase as the ambient noise level will be exceeded. The impact during the construction phase will be difficult to mitigate.

Noise impacts were modelled for the operational phase, taking into consideration noise sensitive areas (NSAs) (i.e. receptors of noise impacts, such as offices or houses). The noise modelling (using WindPro Software) is precautionary, and does not take into account the masking effect that ambient wind noise will have on the turbine noise. Ambient noise increases as the wind speed increases. Under very stable atmospheric conditions (e.g. temperature inversion or a light wind), the turbines will in all likelihood not be operational as the cut-in speed is 4 m/s. As the wind speed increases above the cut-in speed, the ambient noise will also increase. If the atmospheric conditions are such that the wind is very light (<4 m/s) at ground level but exceeds the cut-in speed at hub height, it is feasible that little ambient noise masking will occur. The critical wind speeds are thus between 4-6 m/s when there is a possibility of little masking. Above 8 m/s the wind noise starts masking the turbine noise. The noise modelling indicates that provided that the mitigation measures presented in the noise specialist study are implemented effectively all the turbine positions met the required 500 m setback distance except for WTG 14 that is too close to NSA 10 (i.e. 413 m). . **This house will however be not be occupied once construction commences. The resident will be relocated (see letter from landowner in Appendix 9.4).**

Assessment rating:

The overall noise impact with recommended mitigation is expected to be **negative** and of **low significance**.

Both alternative layouts were assessed with 30.6 MW being the Preferred Alternative with a maximum of 17 turbines and 50 MW being Alternative 1 with a maximum of 28 turbines. The actual assessment and modelling of the 50 MW wind farm was done in a separate noise study and is included in the Draft EIA Report (CSIR, 2012).

The overall impact ratings for the two alternatives will remain the same.

Mitigation

- All construction operations should only occur during daylight hours if possible;
- No construction piling should occur at night. Piling should only occur during the hottest part of the day to take advantage of unstable atmospheric conditions;
- Ensuring that construction staff is given “noise sensitivity” training;
- Use temporary noise screens around noisy, static equipment and activities such as generators, piling, cutting and drilling to reduce the noise levels at the residential buildings; and
- Ambient noise monitoring to be conducted at the 11 NSAs when operations commence to verify the noise emissions meet the noise rating limit.

15.7 ECONOMIC IMPACTS

The main impacts identified during the construction and operational phases of the project include the following:

- Impacts on land owners within the site boundaries;
- Impact on surrounding land uses;
- Impacts on tourism; and
- Impacts on commercial activity associated with expenditure linked to the construction and operation of the development.

When considering the overall costs and benefits of the project it was found that the latter should be more prominent allowing for the achievement of a net benefit. Benefits would be particularly prominent for the project proponents, land owners on the site and in the achievement of national and regional energy policy goals. The project would also result in significant positive economic spin-offs primarily because of the large expenditure injection associated with it.

Positive cumulative impacts are also likely as the project should set a positive precedent for further investment in the area. By committing to investment in a large development, the proponent would be casting a strong ‘vote of confidence’ in the local economy. This has the potential to influence other investors (including locals) to also act with similar confidence thereby resulting in cumulative impacts on overall investment levels.

The key source of potential **negative cumulative impacts** is the project’s risk to tourism when combined with other planned wind farm projects in the area. It is not clear how significant these risks would be particularly in the absence of a regional study focusing on this question. The lack of such a study in the area should be viewed as a significant information gap. In the absence of such a study, it is probably reasonable to tentatively rate cumulative risks as medium significance particularly when one considers the international literature on the subject and the findings of the visual specialist studies for the wind projects in the area. With respect to risks and negative impacts, these are difficult to assess accurately but should prove to be acceptable provided adequate mitigation is put in place much of which will revolve around optimal turbine locations.

Assessment rating:

The significance of the impact associated with project investment or expenditure during the construction phase would be **positive and medium (without mitigation) and medium (with mitigation)**.

The significance of the impact associated with project investment or expenditure during the operational phase would be **positive and low to medium (without mitigation) and medium (with mitigation).**

The significance of the impact on tourism during the operational phase would be **negative and medium (without mitigation) and medium (with mitigation)**.

The significance of the impact on the land owners during the operational phase would **be positive and low to medium (without mitigation) and medium (with mitigation).**

The significance of the impact associated with project investment or expenditure during the construction phase would be **positive and medium (without mitigation) and medium (with mitigation)**.

Both alternative layouts were assessed in the Economics study. The overall impact ratings for the two alternatives would remain the same, but the following general observations can be made regarding nuances between the alternatives. The 50 MW alternative 1 would entail a larger overall investment and expenditure in the area when compared with the 30.6 MW alternative which would lead to higher positive impacts on associated economic activity, jobs and incomes.

Mitigation

- Impacts on tourism are dependent on how the site is developed and managed to minimise negative biophysical impacts. The measures recommended in other specialist reports to these impacts (primarily the minimisation of visual, noise and ecological impacts) would thus also minimise tourism impacts;
- Adequate setbacks from buildings, structures and residences to be strictly enforced;
- Set targets for use of local labour and maximise opportunities for training;
- Use local sub-contractors where possible; and
- Explore ways to enhance local community benefits with a focus on broad-based BEE through mechanisms such as community shareholding schemes and trusts and preferential procurement in accordance with the relevant Department of Energy bidding guidelines for Independent Power Producers.

15.8 IMPACT ON ARCHAEOLOGY

The proposed Banna Ba Pifhu Wind Energy Facility site is more than 5 kilometres from the coast and falls outside the coastal sensitive zone. The proposed wind energy site has been ploughed in the past and is now covered by dense short grass which made it difficult to find archaeological materials. Apart

from a few Early and Middle Stone Age stone tools exposed in a track, no significant sites/materials were found and it is highly unlikely that *in situ* archaeological material/sites will be exposed during development.

Assessment rating:

Visually, the area investigated appears to be of **low archaeological sensitivity** and the impact of construction will be **low**. Together with the other proposed wind energy facilities proposed for the coastal foreland, this development will add to the general accumulative visual impact on the area, but will have little visual effect on the nearby coastal pre-colonial archaeological landscape.

Both alternative layouts were assessed (30.6 MW and 50 MW) and both assessment ratings are of **low significance (after mitigation)**.

Mitigation

- In the unlikely event that any concentrations of archaeological material are uncovered during further development of the site, it should be reported to the Albany Museum and/or the South African Heritage Resources Agency immediately so that systematic and professional investigation/excavations can be undertaken. Sufficient time should be allowed to remove/collect such material; and

- Construction managers/foremen should be informed before construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow when they find sites. It is suggested that a person be trained to be on site to report to the site manager if sites are found.

15.9 IMPACT ON PALAEONTOLOGY

The Banna Ba Pifhu study area is entirely underlain by Devonian marine rocks of the Lower Bokkeveld Group (Ceres Subgroup). These shallow marine sediments are *potentially* highly fossiliferous, but in practice on the southern coastal plain their fossil content has been largely or completely obliterated by high levels of deformation (e.g. cleavage development, especially within mudrocks) and by deep chemical weathering. Their effective palaeontological sensitivity is consequently very low and developments here are rated as of *low* significance in fossil heritage terms. No specialist palaeontological mitigation is regarded as necessary for this wind energy project.

Assessment rating:

The operational and decommissioning phases of the Banna Ba Pifhu Wind Energy Project are unlikely to have any significant impacts on local fossil heritage. The overall impact on palaeontology (with mitigation) is therefore expected to be **negative** and of **Low significance (after mitigation)**.

Both alternative layouts were assessed (30.6 MW and 50 MW) and both assessment ratings are of **low significance**.

Mitigation

Should substantial fossil remains be exposed at any stage during development, these should be safeguarded - *in situ*, if feasible – and recorded by the responsible Environmental Control Officer (photos, GPS readings). SAHRA should be alerted as soon as possible so that appropriate mitigation measures may be considered.

15.10 IMPACT ON WETLANDS AND OTHER AQUATIC ECOSYSTEMS

This study has assessed a number of aquatic ecosystems, which were mostly characterised as wetlands or ephemeral drainage lines. The wetlands perform an important role in attenuating surface water flows, while providing a series of differing wetland habitats, which form part of a wetland network within the region.

The main potential impacts associated with the construction and operational phases are:

- Physical destruction of aquatic habitat;
- Loss of wetland habitat, ecosystem services and biodiversity services;
- Loss of species of special concern;
- Habitat fragmentation – loss of ecological corridors; and
- Sedimentation and erosion.

The crossing and any new structures being placed within 500 m of the wetland areas or 32 m from any water course, although posing a low risk to the aquatic environment, would require approximately 8 Section 21 c & I water use license applications. This process will however be taken forward with the Department of Water Affairs (DWA) and the layout and technical details will be assessed with regard the potential impacts by this department. Should DWA then feel that the applications pose a great risk to the aquatic environment, and then they may request that the layout be altered.

Assessment rating:

It seems based on the site visit and information contained in the specialist ecological report (Chapter 5) that the impacts assessed for the aquatic systems after mitigation, would be negative and of **low significance (after mitigation)**. This is dependent on the proposed recommendations, contained in that report and in this study being upheld. This project would thus present a **low risk to the aquatic environment**.

Both alternative layouts were assessed in the Wetland and Aquatic Impact Assessment (30.6 MW and 50 MW). Due to the nature of the impacts and the current state of the water courses in the study area both of the proposed alternatives would have similar potential impacts on the aquatic environment. However due to the consolidated nature of the preferred alternative (30.6 MW), the potential impacts would present a lower risk, as well as reduce the number of Water Use License Applications required.

Mitigation

- Stormwater should be managed using suitable structures such as swales, gabions and rock rip-wrap so that any run-off from the development site is attenuated prior to discharge. Silt and sedimentation should be kept to a minimum, through the use of the above mentioned structures by also ensuring that all structures don't create any form of erosion;
- Vegetation clearing should occur in parallel with the construction progress to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment;
- Only indigenous plant species must be used in the re-vegetation process. The species list mentioned in this and terrestrial vegetation study should be used a guide;
- All construction materials including fuels and oil should be stored in demarcated areas that are contained within berms / bunds to avoid spread of any contamination into wetland or rivers. Washing and cleaning of equipment should also be done in berms or bunds, in order to trap any cement and prevent excessive soil erosion. These sites must be re-vegetated after construction has been completed. Mechanical plant and bowsers must not be refuelled or serviced within or directly adjacent to any river channel. It is therefore suggested that all construction camps, lay down areas, batching plants or areas and any stores should be more than 50m from any demarcated wetland or riverine area;
- It is also advised that an Environmental Control Officer (ECO), with a good understanding of the local flora be appointed during the construction phase. The ECO should be able to make clear recommendations with regards to the re-vegetation of the newly completed / disturbed areas, using selected species detailed in this and the terrestrial vegetation report. All alien plant re-growth must be monitored and should it occur these plants should be eradicated. Where any works (e.g. storm water control measures) near a wetland or river is required specific attention should be paid to the immediate re-vegetation of cleared areas to prevent future erosion of sedimentation issues; and
- All relevant buffers mentioned in this report should be included into future designs and later engineering diagrams.

15.11 IMPACT ON AGRICULTURAL SOIL POTENTIAL

An overview investigation of soil conditions and agricultural capability at the site of the wind energy project proposed by WKN Windcurrent at the Farm Broadlands, near Humansdorp was done. The aim of this study was to investigate the potential impacts of the proposed development on the site's agricultural production and resource base. This included an investigation of soils and other agricultural resources across the site.

The soil investigation was based predominantly on an investigation of existing cuttings on the site, in combination with assessing topography, geology and surface conditions, and shallow auger holes were also used. This soil investigation methodology was considered completely adequate to gain a sufficiently accurate assessment of the agricultural soil capability across the site.

The soils are all residual soils that have formed from the weathering of underlying Bokkeveld mudrocks, and the underlying C horizon of all soils comprises partially weathered mudrocks. The soil catena (sequence of different soil types along a topographical transect) on this site, running north to south, is from well-drained Glenrosa (on the north facing slopes) to Swartland (on the well drained flat crest) to Sepane with some drainage limitations and then to Estcourt and Kroonstad on the poorly drained landscape positions to the south.

In terms of soil limitations to agricultural production, the soils are primarily limited by their shallow effective depth. Soils to the south, particularly in low lying spots, are limited by poor drainage as well. Due to these limitations, the majority of the soils are categorised as **medium agricultural suitability**. Those in particularly poorly drained positions are classified as **low agricultural suitability**.

Impacts on agricultural resources and productivity were identified as:

- Loss of agricultural land;
- Disturbance of run-off and resultant potential impact on erosion;
- Disturbance of existing contour banks;
- Soil profile disturbance and resultant decrease in soil agricultural capability;
- Prevention of crop spraying by aircraft over land occupied by turbines;
- Disturbance of cultivation practices due to the division of existing camps by turbines and access roads;
- Placement of spoil material generated from excavations;
- Yield reduction; and
- Prevention of possible future agricultural activities on land occupied by turbines.

A number of mitigation measures have been implemented to significantly mitigate the impacts of the wind farm development on agricultural resources and productivity. These are listed below. The most significant of these involve the layout of the wind farm, which has been done to minimise various agricultural impacts. After mitigation, the loss of agricultural land was determined as only 8.38 hectares for the preferred 30.6MW alternative, which represents a mere 0.7 % of the land surface of the farm.

Assessment rating:

All the identified impacts on agricultural resources and productivity were considered to be **negative** and of **low significance after mitigation**. The proposed wind energy project therefore poses a low level of disturbance to current or likely future agricultural productivity.

Both alternatives were assessed in the agricultural soil potential study. The preferred alternative of 30. 6 MW has a lower footprint and therefore a lower loss of agricultural land and a lower agricultural impact compared to the 50 MW alternative 1. However the difference is not large (1.1% of the farm for alternative 1 and 0.7% for the preferred alternative) and the significance of the impacts is low for both alternatives.

Mitigation

- Water run-off from all constructed and altered surfaces including roads, where slopes pose an erosion hazard, will be managed with an appropriate system to divert or channel any collected run-off water into existing natural or constructed waterways;
- An effective run-off management plan is a specific requirement of the Environmental Management Plan. As part of this, erosion will be monitored and corrective action will be implemented to the run-off plan in the event of any erosion problems;
- The layout of turbines and hard standings for cranes has been done on positions of minimum slope (see site plan in Agricultural specialist study, Chapter 14);
- No new roads are proposed on slopes where erosion is a potential hazard (For all excavations and other direct disturbance of the soil surface (e.g. for roads, buildings) that are to be returned to agricultural use, the upper 20cm of the top soil will be stripped, stockpiled, and then re-spread over the surface of the backfilled excavation or disturbed surface, during rehabilitation;
- The wind farm utilises existing roads wherever possible and so the length of required new roads, and disturbance to agricultural soil as a result, is minimised (see site plan);
- If crop spraying by aircraft is ever required, the wind farm undertakes to lock all necessary turbines (with 1 day's notice) with the blades parked in parallel to facilitate easy access for aeroplanes between them. Crop spraying by aeroplane is usually done when there is little or no wind;
- The distance between turbines facilitates easy access for aeroplanes between them;
- Most turbines and new access roads are positioned on non cultivated, grazing land, where mechanised vehicular traffic is not required for cultivation; and
- WKN Windcurrent is committed to enabling the landowner to use the property for sustainable agriculture and as such will not limit usage of the area. In the event that an activity would interfere with the free flowing of the wind to the turbine, the landowner and WKN Windcurrent would need to come to an agreement as to the exact location of such activities.

15.12 OTHER IMPACTS

Historical and cultural features

No cemeteries or burial sites have been identified or mapped on the sites proposed for the Banna Ba Pifhu wind energy project. Therefore no impacts on such features are expected. Nonetheless, it is noted as a general mitigation measure that should any historical or cultural features (e.g. burial sites) be identified during the construction process, then any disturbance thereof must be avoided, and the features must be fenced off. No disturbance or development should occur in an area of 20 m from the fence around the historical or cultural features.

Aviation

WKN Windcurrent obtained approval from the South African Civil Aviation Authority for the proposed Banna Ba Pifhu project (see Appendix G of the Final EIA Report).

Shadow Flicker

A shadow flicker study was undertaken by WKN Windcurrent and the data from the study are included in the visual report (Chapter 8). The data were analysed by the visual specialist on the project team, Mr Henry Holland of Map(this). He identified the potential impacts of shadow flicker and proposed mitigation measures to reduce the potential impacts. Two buildings have been identified as at high risk of shadow flicker annoyance for more than 30 hours per year. It is unlikely that they will experience shadow flicker as frequently as that but there are mitigation measures which should minimise or eliminate the risk.

WTG 14 has been determined as the main cause of the potential shadow flicker effect. The most appropriate mitigation measure is using technology which takes into account wind speed, wind direction and the position of the sun for automatic shut-down to be within the 30 hours/year and 30 minutes/day guidelines.

15.13 NO GO OPTION

The “no go” option was investigated during the EIA process. If the project does not proceed, the following opportunities would be lost:

- Lost income for workers from the Kouga Municipality which would probably amount to R3.3 million during the construction phase of the project;
- Lost opportunity to establish renewable energy facilities in the Kouga region and in the promotion of renewable energy;
- Lost opportunity for increased generation capacity in the Eastern Cape, especially in the Kouga area, a region that requires increased power supply and grid stability;
- Delay in the metro reaching its target of 10% power from renewable energy;
- Lost opportunity to contribute approximately 30.6 MW of additional generative capacity of green energy to the South Africa, with zero CO_2 emissions. The proposed Banna Ba Pifhu project of a 30.6 MW could offset over 61 200 tonnes of CO_2 per year, or 1 224 000 tonnes of CO_2 over the

lifetime (20 years) of the project [1],[2]. Additional power to the local grid will continue to be provided via Eskom, with power generation approximately 90% coal-based with associated high levels of CO2 emissions and water consumption; and

- Lost opportunity to reduce the requirement for new long-distance high-voltage transmission lines to the Eastern Cape and thereby reduce the significant impacts of these transmission lines, especially in terms of visual impacts and impacts on birds (e.g. from collisions, causing injury or mortality). The generation of coal-based power to provide an additional 30.6 MW in the western region of the Eastern Cape requires the transport of the power over considerable distances (e.g. approximately 1200 km from coal power stations in Mpumalanga).

Conversely, if the project does not proceed, the following negative impacts could be avoided:

- Avoid the potential impacts on fauna and flora;
- Avoid the potential impacts of the turbines on birds and bats. However, additional fossil-fuel based electricity could still be required to meet the projected growth of the Kouga municipal area and the Nelson Mandela Bay Metro, necessitating additional transmission lines, which would in turn escalate the risk of bird and bat mortalities;
- Avoid the potential visual and noise impacts of a maximum of 17 turbines on the local environment;
- Avoid the potential impacts on the archaeological and palaeontological resources on site;
- Avoid the potential impact on the aquatic systems, including wetlands on site; and
- Avoid the potential impact on the agricultural soil potential on site.

Based on the findings of this EIA process, the "no-go" option is not recommended, for the following reasons:

- The proposed project area is an appropriate location for a wind energy project of this scale, in terms of factors such as need for the energy, suitable wind regime, and available supporting infrastructure such as grid connection and road access;
- If wind energy is not promoted in this area of the Eastern Cape, additional power may need to be transported to the region via new high-voltage transmission lines extending over more than a thousand kilometres (e.g. from coal-power stations in Mpumalanga). These power lines would have significant environmental impacts (e.g. visual impacts and impacts on birds);
- With mitigation applied effectively, the predicted negative impacts of the project are mostly of **Low** to **Medium** significance. The only exception is the visual impacts of the turbines, which are predicted to be of **High** significance (negative), given the vertical scale of the project;
- A twelve month pre-construction bird monitoring programme was undertaken at the proposed wind farm site by two experienced bird monitors under the guidance of the bird specialist, Chris van Rooyen. The monitoring commenced in March 2011 and continued until April 2012. The monitoring was done over four sampling periods, i.e. summer, winter/early spring, late spring and autumn. The specific objectives of the monitoring programme were to record the abundance and diversity of all birds, and flight patterns of priority species. The results from the pre-construction monitoring programme and the proposed mitigation measures based on the monitoring are included in the updated Bird specialist study (Chapter 6 of the Final EIA Report) and informed the turbine layout for the 30.6 MW preferred option.
- The **updated bat specialist report** included in the Final EIA Report was prepared by Natural Scientific Services (NSS). An initial bat assessment was conducted by Stephanie Dippenaar in late

[1] http://www.iea.org/co2highlights/

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

2011 and this study was included in the Draft EIA Report. The report prepared by Stephanie Dippenaar was part of the desktop review for the bat specialist report prepared by NSS. Natural Scientific Services has been commissioned by WKN Windcurrent to conduct a **twelve month bat monitoring programme** which is being completed to satisfy the requirements of the South African Good Practice Guidelines for Surveying Bats in Wind Farm Developments (Sowler & Stoffberg, 2012). The bat monitoring at the Banna Ba Pifhu site commenced in mid April 2012 and is scheduled to run until mid April 2013. The bat monitoring was conducted over two seasons, autumn and winter. The data collected to date are included in the Final EIA report and therefore incorporate on-site data measured compared with preliminary data collected at the start of the project. Chapter 7 on bats serves as a Preliminary Bat Impact Report with a final detailed monitoring report to be submitted mid-May 2013 and incorporated into the EMP as part of the detailed project planning.

15.14 CONSIDERATION OF ALTERNATIVES

During the pre-feasibility for the project, WKN Windcurrent reviewed a range of potential sites in the Kouga Region. Based on the review of various factors, the Banna Ba Pifhu site near Humansdorp was selected to be taken forward in this EIA. Following site selection WKN Windcurrent moved forward towards a feasibility study. An environmental screening study for the site was undertaken by the CSIR in November 2009. Based on this preliminary screening, it was concluded that there were no fatal flaws identified from an environmental perspective that would necessitate termination of the project at this stage, provided that the exclusion criteria are reviewed in more detail as part of the forthcoming planning in the EIA phase.

Apart from the “no-go” alternative, various other types of alternatives are considered in this EIA. These are described in Chapter 4 of this EIA Report, with the main alternatives being:

- **Land use alternatives** – The physical footprint of the turbines is very limited. Turbines will be supported on foundations dimensioned to the geotechnical properties, for example reinforced concrete spread foundations of approximately 20 m by 20 m at a maximum depth of 3 m. The farm covers approximately 1138 ha. After construction, the turbine mast footprints will cover approximately 8.38 ha which comprises 0.7 % of the total study area. Current cattle farming activities would continue beneath and around the turbines.
- **Technology alternatives** – Options such as vertical axis technology for wind turbines were considered at a conceptual level, and found to be unsuitable for the proposed project**.**
- **Project scale and number of turbines alternatives** – The scale of the Banna Ba Pifhu wind energy project has been reduced from 50 MW to 30.6 MW. Both alternative layouts are assessed in the Final EIA report, with 50 MW being alternative 1 with a maximum of 28 turbines, and **30.6 MW being the preferred alternative** with a minimum of 9 and a maximum of 17 turbines (the actual number will be dependent on the capacity of the turbines selected in the range between 1.8 and 3.2 MW).

15.15 CUMULATIVE EFFECTS

In terms of cumulative effects, other wind energy EIAs are in process or have received Environmental Authorisation in the Kouga region (see Table 15.2) .Some of these projects have received Environmental Authorisation, i.e. the WKN Windcurrent Ubuntu wind energy project near Jeffrey's Bay comprising 100 MW, the Mainstream SA wind farm project between Humansdorp and Jeffrey's Bay comprising 180 MW; and the Redcap project near St Francis Bay and Oyster Bay that consists of three separate clusters of turbines with a maximum capacity of 300 MW.

The cumulative impacts of the projects listed in Table 15.2 have been considered and assessed in the specialist studies included in this Draft EIA Report. However, the specialists noted that it is impossible to predict at this stage what the cumulative impact of all the proposed wind developments will be on birds and bats, firstly because there is no baseline to measure it against, and secondly because the extent of actual impacts will only become known once a few wind farms are developed. It is imperative that pre-construction and post-construction monitoring programmes are implemented at all the proposed sites, in accordance with the *Best practice guidelines* available locally for bird and bat monitoring.

Furthermore, it needs to be understood that the existing power grid in the Kouga area can only accommodate a limited capacity for electrical transmission.

Table 15.2: Proposed Wind Farms in the Kouga Region

Environmental Practitioner	Last document released, approval status	Applicant	Location	Number of Turbines	Capacity MW
Savannah Environmental (Pty) Ltd	Environmental Authorisation obtained (August 2011)	VentuSA Energy Corp (Pty) Ltd	Dieprivier Mond, 17km west of Humansdorp north of the N2	Up to 50	100
Savannah Environmental (Pty) Ltd	Environmental Authorisation obtained	African Clean Energy Developments (Pty) Ltd	Near Cookhouse in the Eastern Cape	Up to 50 turbines	Up to 40
Savannah Environmental (Pty) Ltd	Environmental Authorisation obtained	VentuSA Energy Corp (Pty) Ltd	Happy Valley, 3 km west of Humansdorp near the N2	20	40
Savannah Environmental (Pty) Ltd	Environmental Authorisation obtained	Exxaro Resources and Watt Energy (Pty) Ltd Tsitsikamma community	The proposed site is situated approximately 30 km west of Humansdorp, south of the N2 National Road in the Tsitsikamma area	Maximum of 50	100
CSIR	Environmental Authorisation obtained (April 2011)	Mainstream SA	Between Jeffrey's Bay and Humansdorp north of the N2	40 to 85	180
CSIR	Environmental Authorisation obtained (June 2012)	WKN Windcurrent	Ubuntu wind energy project located approximately 4 km to 7 km north north west of the town of Jeffrey's Bay	31 to 50	100
Arcus Gibb http://projects.gibb.co.za/Projects	Environmental Authorisation obtained (June 2011)	Redcap Invest.	Western Sector to the east of the Tsitsikamma River	50 to 150	100 to 300
			Central Sector near Oyster Bay		
			Eastern Sector north of St Francis Bay		

15.16 PERMIT AND PERMISSION REQUIREMENTS

Before clearing of the proposed site is initiated, the appropriate Environmental Authorisation must be obtained in terms of the National Environmental Management Act (NEMA) and associated NEMA Regulations of 2010. Should the project proceed, micro-siting and planning of access roads would need to be conducted.

If the project leads to the removal of protected plant or animal species, then a permit is needed from the provincial department of Economic Development and Environmental Affairs (DEDEA) for the removal and/or destruction of species protected by the Provincial Nature Conservation Ordinance of 1974. In order to obtain permission to remove or destroy species occurring under the Provincial Nature Conservation Ordinance of 1974 DEDEA must receive notification of the area(s) intended to be cleaned together with an application form.

Should any archaeological or palaeontological materials/sites be found during construction of the wind farm, a permit must be obtained from the South African Heritage Resources Agency (SAHRA) to remove such remains. Such removal should be undertaken by a professional archaeologist / palaeontologist.

15.17 OVERALL EVALUATION OF IMPACTS BY THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

No negative impacts have been identified that, in the opinion of the Environmental Assessment Practitioner, should be considered “fatal flaws” from an environmental perspective, and thereby necessitate substantial re-design or termination of the project.

The EIA process included a synthesized mapping of “no go” areas using environmental constraints provided by the specialist team (Figure 15.1). This mapping guided the layout of turbines and internal access roads. In this way, the environmental and social constraints of the site informed the scale and configuration of the proposed project. Through the course of the EIA process, the project layout went through several iterations after consultation with the specialists on the project team. This indicates how the EIA process has actively and effectively informed the project planning.

Residual impacts are those that are expected to remain once appropriate mitigation has been implemented. The main residual negative impacts of the Banna Ba Pifhu Wind Energy Project are the predicted impact on birds and bats, and the visual impact.

- The impact on birds arises from the possible displacement of priority bird species during the construction and operational phases of the project. The impacts are predicted to be high to medium (after mitigation) during the construction phase and Medium to Low (after mitigation) during the operational phase depending on whether habituation takes place or off-set compensation is implemented. The impact on birds arising from the collision of priority species with turbines is predicted to be Low (after mitigation with low to medium levels of confidence).
- The loss of conservation important bat species from the area due the construction and operational activities is anticipated to be negative and of medium significance with mitigation.
- The visual impacts of the turbines on the landscape character are predicted to be negative and of high significance.

If the Banna Ba Pifhu wind farm is established, the actual physical footprint of the wind turbines is limited to approximately 8.38 hectares for the preferred 30.6 MW alternative, which represents a mere 0.7% of the land surface of the farm, and grazing and other agricultural activities can continue in parallel with the operation of the turbines. The project will have no significant impact in terms of loss of agricultural productivity.

In conclusion, given South Africa's need for additional electricity generation and efforts to decrease the country's proportional dependency on coal-based power, renewable energy has been identified as a national priority, with wind energy identified as one of the most readily available, technically viable and commercially cost-effective sources of renewable energy. Taking into consideration the findings of the EIA process for the proposed Banna Ba Pifhu wind energy project near Humansdorp, it is the opinion of the Environmental Assessment Practitioner that the project benefits outweigh the costs, and that the project will make a positive contribution to steering South Africa on a pathway towards sustainable development. Provided that the specified mitigation measures are applied effectively, it is proposed that the project receives Environmental Authorization in terms of the EIA Regulations promulgated under the National Environmental Management Act (NEMA).

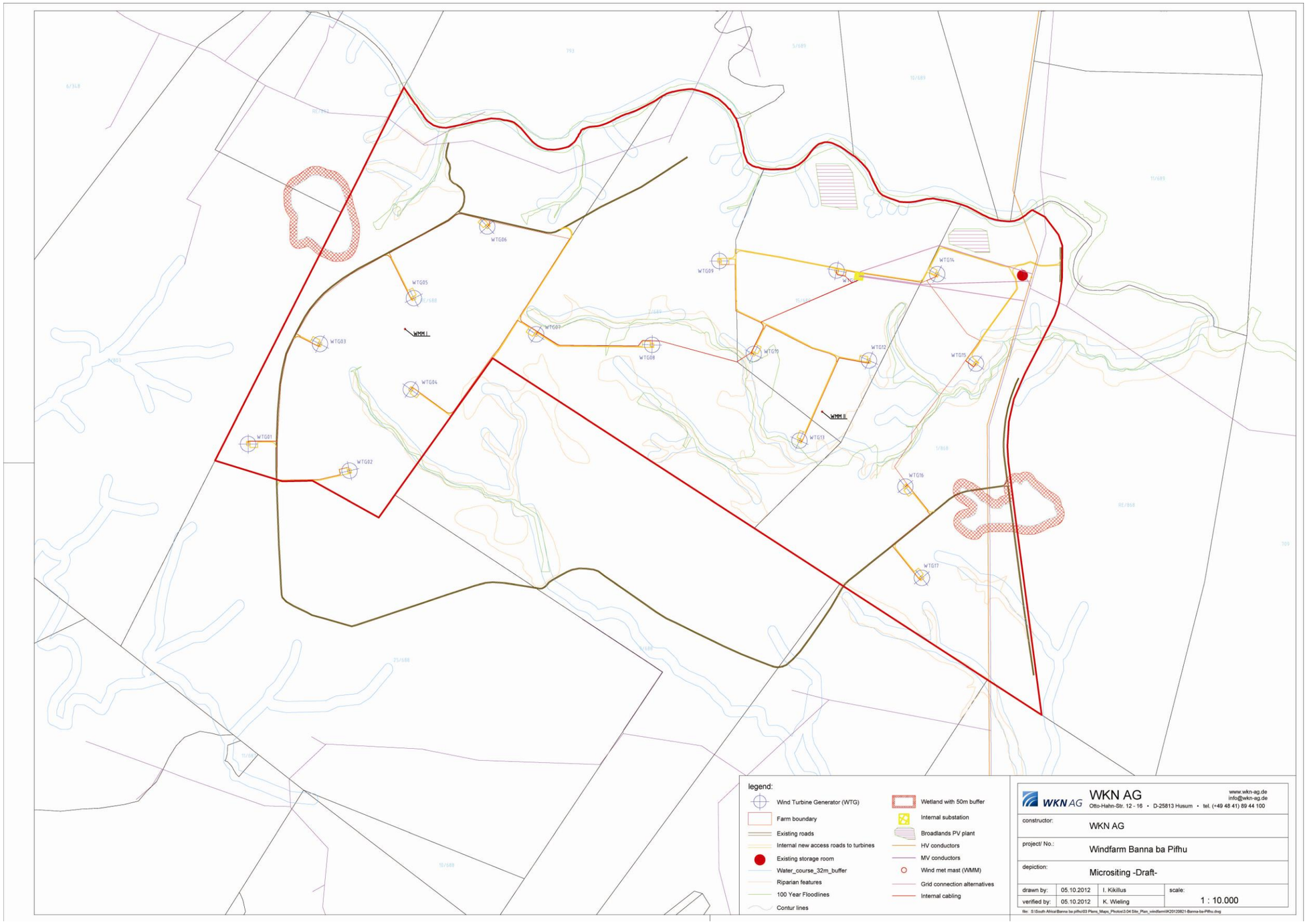

Figure 15.1: Conceptual layout map for the proposed Banna Ba Pifhu project.