# Fauna and Flora Specialist Ecological Study

## Scoping and Environmental Impact Assessment for the Proposed Development of the Impofu West Wind Farm Near Oyster Bay, Eastern Cape Province: EIA REPORT

Prepared for Aurecon South Africa (Pty) Ltd on Behalf of Red Cap Impofu West (Pty) Ltd

By 3Foxes Biodiversity Solutions (Pty) Ltd

March 2019

# EXECUTIVE SUMMARY

Red Cap Energy (Pty) Ltd has appointed Aurecon South Africa (Pty) Ltd to undertake the required application for environmental authorisation process for the proposed Impofu West Wind Farm located near to Oyster Bay in the Eastern Cape Province. It is anticipated that the Impofu West Wind Farm would be comprised of up to 41 turbines of between 3-5MW each. The development is currently in the EIA Phase and Red Cap Impofu West (Pty) Ltd has appointed 3Foxes Biodiversity Solutions to provide a specialist terrestrial biodiversity EIA Phase Study of the development site as part of the EIA process.

Several site visits as well as a desktop review of the available ecological information for the area was conducted in order to identify and characterise the ecological features of the site. The Impofu West WEF site consists largely of Tsitsikamma Sandstone Fynbos and Southern Cape Dune Fynbos with small patches of Southern Afrotemperate Forest in kloofs and along drainage systems. The majority of the Tsitsikamma Sandstone Fynbos within the site has been lost to transformation but there is a large tract of intact Southern Cape Dune Fynbos in the south of the site. The transformation of the area for agriculture has significantly affected the abundance and distribution of fauna at the site. The transformed areas which dominate the Impofu West site have low faunal value and diversity. The intact areas are however home to a variety of listed species, including the confirmed presence of Cape Clawless Otter *Aonyx capensis* (Near Threatened) and Blue Duiker *Philantomba monticola* (Vulnerable). There are several listed reptile species known from the area, but none of these were observed at the site and it is unlikely that they would be significantly affected by the development and no important reptile habitats would be significantly impacted by the development. The diversity of frogs in the wider study area is high, but there are no listed species that are likely to be affected by the development and due to the avoidance of aquatic features by the development footprint, impacts on frogs and frog habitats would be low and no significant impacts on any particular species or habitats would occur.

In terms of the impact of the development on Critical Biodiversity Areas (CBAs), the results of the field assessment indicate that there has been significant land-use change since the Garden Route CBA map was produced in 2010 and the majority of the turbines within these CBAs are in areas that have since been transformed. These areas no longer contain any biodiversity of significance and the underlying reasons these areas were classified as CBAs have been lost. Development within these areas is therefore not considered to have a significant impact on CBAs and the overall impact of the development on CBAs, Ecological Support Areas (ESAs) and broad-scale ecological processes is likely to be low and is mediated by the low overall development footprint within intact habitats.

As there are already several operational wind farms in the area, the potential for cumulative impacts in the Impofu West study area is a significant concern. The primary driver of habitat loss and cumulative ecological impact in the area to date has been transformation for agricultural production. Due to the high existing levels of transformation, the area is considered vulnerable to further impact and it is likely that some ecological processes such as dispersal ability of some species has already been compromised. The additional contribution of wind farm development to

direct habitat loss has been low to date. The potential contribution of the Impofu West Wind Farm to existing impact is considered to be low and there do not appear to be any fauna or flora present within the Impofu West site that would be particularly impacted or vulnerable to wind farm development given the layout that has been provided for assessment.

In terms of the layout assessed, the high sensitivity and recommended No-Go areas identified have been avoided and there are no turbines in areas considered unsuitable for wind farm development. The layout assessed has been developed iteratively in response to the current sensitivity mapping, which has in turn been extensively verified and validated in the field. As such, there is little uncertainty with regards to the sensitivity mapping at the site and this is important in providing confidence with regards to the predicted impacts of the development on the ecological features of the site.

There are no predicted negative impacts associated with the Impofu West development that cannot be mitigated to a low level. This is driven largely by the transformed nature of large tracts of the site as well as the avoidance of sensitive features that has already been implemented in the conceptual design phase by the developer. Residual impacts associated with the development are low and considered acceptable. Mitigation outcomes and biodiversity benefits of actions such as alien clearing could be enhanced through coordination and collaboration with the Greater Kromme Stewardship Initiative which is already active in the area.

**Impofu West WEF Impact Statement**

There are no negative impacts associated with the development of the Impofu West WEF that cannot be mitigated to a low level. The final footprint of the development is well within the limits of acceptable habitat loss that were defined for the site and no thresholds of concern were exceeded. With the application of relatively simple mitigation and avoidance measures, the impact of the Impofu West WEF on the local environment can be reduced to a low and acceptable magnitude. The contribution of the Impofu West WEF development to cumulative habitat loss and impact in the greater Oyster Bay area would be low and is considered acceptable. Overall, there are no specific long-term impacts likely to be associated with the development of the Impofu West WEF that cannot be reduced to a low significance. As such, there are no fatal flaws associated with the development and no terrestrial ecological considerations that should prevent it from proceeding.

# Compliance with Appendix 6 of the 2014 EIA Regulations, as Amended

| Requirements of Appendix 6 – GN R326 2014 EIA Regulations, 7 April 2017 | Addressed in the Specialist Report |
|---|---|
| 1. (1) A specialist report prepared in terms of these Regulations must contain-<br>a) details of-<br>i. the specialist who prepared the report; and<br>ii. the expertise of that specialist to compile a specialist report including a curriculum vitae; | vii |
| b) a declaration that the specialist is independent in a form as may be specified by the competent authority; | ix |
| c) an indication of the scope of, and the purpose for which, the report was prepared; | Section 1 |
| (cA) an indication of the quality and age of base data used for the specialist report; | Section 1.6 |
| (cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change; | Section 3.5 |
| d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment; | Section 1.3 |
| e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used; | Section 1 |
| f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives; | Section 3 |
| g) an identification of any areas to be avoided, including buffers; | Section 3.6 |
| h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers; | Section 3.6 |
| i) a description of any assumptions made and any uncertainties or gaps in knowledge; | Section 1.5 |
| j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities; | Section 3 |
| k) any mitigation measures for inclusion in the EMPr; | Section 6 |
| l) any conditions for inclusion in the environmental authorisation; | N/A |
| m) any monitoring requirements for inclusion in the EMPr or environmental authorisation; | Section 6 |
| n) a reasoned opinion-<br>i. whether the proposed activity, activities or portions thereof should be authorised;<br>(iA) regarding the acceptability of the proposed activity or activities and<br>ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan; | Section 7 |
| o) a description of any consultation process that was undertaken during the course of preparing the specialist report; | See Main Report |
| p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and | See Main Report |
| q) any other information requested by the competent authority. | |
| 2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply. | N/A |

# Table of Contents


**EXECUTIVE SUMMARY I**
**COMPLIANCE WITH APPENDIX 6 OF THE 2014 EIA REGULATIONS, AS AMENDED III**
**TABLE OF CONTENTS IV**
**LIST OF FIGURES VI**
**SHORT CV/SUMMARY OF EXPERTISE VII**
**SPECIALIST DECLARATION IX**
**SPECIALIST FAUNA AND FLORA EIA STUDY 1**

**1. INTRODUCTION AND METHODOLOGY 1**

**1.1 SCOPE AND OBJECTIVES 1**
TERMS OF REFERENCE 1

**1.2 APPROACH & ASSESSMENT PHILOSOPHY 2**

**1.3 FIELD ASSESSMENT 4**

**1.4 SENSITIVITY MAPPING & ASSESSMENT 5**

**1.5 ASSUMPTIONS AND LIMITATIONS 6**

**1.6 SOURCE OF INFORMATION 7**

**2. DESCRIPTION OF PROJECT ASPECTS RELEVANT TO ECOLOGICAL IMPACTS 8**

**3. DESCRIPTION OF THE AFFECTED ENVIRONMENT 9**

**3.1 VEGETATION TYPES 9**

**3.2 IMPOFU WEST HABITAT DESCRIPTION 12**
3.2.1 SOUTHERN CAPE DUNE FYNBOS 13
3.2.2 TSITSIKAMMA SANDSTONE FYNBOS 14
3.2.3 CROPLANDS, PASTURES AND TRANSFORMED AREAS 15
3.2.4 SOUTHERN AFROTEMPERATE FOREST 16

**3.3 FAUNAL COMMUNITIES 17**
3.3.1 MAMMALS 17
3.3.2 REPTILES 21
3.3.3 AMPHIBIANS 22

**3.4 CRITICAL BIODIVERSITY AREAS 23**

**3.5 CURRENT BASELINE & TRANSFORMATION CONTEXT 24**
3.5.1 CURRENT CONTEXT AND CONTRIBUTION OF WIND FARM DEVELOPMENT TO ECOLOGICAL IMPACT 25

**3.6 SITE SENSITIVITY ASSESSMENT 27**

**4. IDENTIFICATION OF KEY POTENTIAL IMPACTS 28**

**4.1 ECOLOGICAL IMPACTS ASSOCIATED WITH THE IMPOFU WEST WIND FARM 28**
4.1.1 CONSTRUCTION PHASE 29
4.1.2 OPERATIONAL PHASE 29
4.1.3 CUMULATIVE IMPACTS 29
4.1.4 DECOMMISSIONING PHASE 30
4.1.5 NO-GO ALTERNATIVE 30

**5. IMPACT ASSESSMENT CRITERIA 30**

6. IMPACT ASSESSMENT 30
6.1 ECOLOGICAL IMPACTS ASSOCIATED WITH THE IMPOFU WEST WIND FARM 30
6.1.1 CONSTRUCTION PHASE IMPACT 1. IMPACTS ON VEGETATION AND PLANT SPECIES OF CONSERVATION CONCERN 31
6.1.2 CONSTRUCTION PHASE IMPACT 2. DIRECT AND INDIRECT FAUNAL IMPACTS 33
6.1.3 OPERATIONAL PHASE IMPACT 1. OPERATIONAL IMPACTS ON FAUNA 34
6.1.4 OPERATIONAL PHASE IMPACT 2. IMPACTS ON CRITICAL BIODIVERSITY AREAS 35
6.1.5 DECOMMISSIONING PHASE IMPACT 1. ALIEN PLANT INVASION FOLLOWING DECOMMISSIONING 36
6.1.6 DECOMMISSIONING PHASE IMPACT 2. FAUNAL IMPACTS DUE TO DECOMMISSIONING 37
6.2 CUMULATIVE IMPACTS 38
6.2.1 CUMULATIVE IMPACT 1. CUMULATIVE HABITAT LOSS AND IMPACT ON BROAD-SCALE ECOLOGICAL PROCESSES 39
6.3 NO-GO ALTERNATIVE 39
7. CONCLUSIONS AND RECOMMENDATIONS 40
8. REFERENCES 43
9. APPENDICES 44
APPENDIX 1. LIST OF PLANTS 44
APPENDIX 2. LIST OF MAMMALS 45
APPENDIX 3. LIST OF REPTILES 47
APPENDIX 4. LIST OF AMPHIBIANS 49

# List of Figures

Figure 1. Vegetation map (Mucina and Rutherford 2006 and 2012 Powrie Update) of the Impofu West study area and surrounding area. 10

Figure 2. Extract of the vegetation map by Vlok et al. for the Garden Route Initiative. 12

Figure 3. The southern part of the Impofu West site is the only extensive intact tract of the site and consists of Southern Cape Dune Fynbos. Although the major contiguous areas in the south is considered to be a No-Go area, there are also more disturbed fragments around the margin of the intact area which are in a moderate to poor condition. The more disturbed areas as pictured here have a high abundance of disturbance indicators such as *Stoebe plumosa*. 13

Figure 4. Highly degraded Tsitsikamma Sandstone Fynbos in the north of the Impofu West study area. This area has been severely impacted by excessive grazing pressure and some parts of this area may have been transformed in the past. Diversity of the remaining vegetation is low and this area is considered to be moderate to low sensitivity. The primary value of this area is for the maintenance of ecological connectivity and despite being degraded, it retains significantly greater ecological function that the adjacent croplands. 14

Figure 5. Remnant of Tsitsikamma Sandstone Fynbos within croplands within the Impofu West substation footprint. This area is also degraded and has been impacted by fires and grazing. 15

Figure 6.The majority of the northern section of the Impofu West site has been transformed for croplands. 16

Figure 7. Indigenous forest patches occur along drainage lines, on steeper slopes and wetter areas within the site. These areas are considered highly sensitive and considered to be No-Go areas. 17

Figure 8. Common small mammals trapped at the Impofu site include from top left, the Four-striped Grass Mouse, Woodland Dormouse and Pygmy Mouse. 18

**Figure 9.** Examples of camera trap images from the Impofu West site. Clockwise from the top left, Cape Grysbok, Bushbuck, Cape Porcupine, Bushpig, Cape Hare, Blue Duiker, Cape Clawless Otter, Common Duiker. 20

Figure 10. Common reptiles observed at the Impofu West site include from the top, the Cross-marked Grass Snake, Rhombic Night Adder and the Cape Girdled Lizard. 22

Figure 11. Frogs observed at the Impofu West site include from top right, Common Caco, Cape River Frog and Raucous Toad. 23

Figure 12. Critical Biodiversity Areas map for the Impofu West study area, showing the extensively transformed nature of the site apart from the intact dune area in the south. 24

Figure 13. Map of other wind farm developments in the wide area around the Impofu West site indicated in red. 25

Figure 14. Ecological sensitivity map for the Impofu West study area, showing the high level of transformation that the area has experienced and the large remaining intact area of Dune Fynbos in the south which is considered the most important and sensitive part of the site. 27

# Short CV/Summary of Expertise


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Ecological Solutions for People & the Environment

**Simon Todd**

Simon Todd is Director and principal scientist at 3Foxes Biodiversity Solutions and has over 20 years of experience in biodiversity measurement, management and assessment. He has provided specialist ecological input on more than 200 different developments distributed widely across the country. This includes input on the Wind and Solar SEA (REDZ) as well as the Eskom Grid Infrastructure (EGI) SEA and Karoo Shale Gas SEA. He is on the National Vegetation Map Committee as representative of the Nama and Succulent Karoo Biomes. Simon Todd is a recognised ecological expert and is a past chairman of the Arid-Zone Ecology Forum. He is registered with the South African Council for Natural Scientific Professions (No. 400425/11).

*Skills & Primary Competencies*

- Research & description of ecological patterns & processes in Nama Karoo, Succulent Karoo, Thicket, Arid Grassland, Fynbos and Savannah Ecosystems.
- Ecological Impacts of land use on biodiversity
- Vegetation surveys & degradation assessment & mapping
- Long-term vegetation monitoring
- Faunal surveys & assessment.
- GIS & remote sensing

*Tertiary Education:*

- 1992-1994 – BSc (Botany & Zoology), University of Cape Town
- 1995 – BSc Hons, Cum Laude (Zoology) University of Natal
- 1996-1997- MSc, Cum Laude (Conservation Biology) University of Cape Town

*Employment History*

- 2009 – Present – Sole Proprietor of Simon Todd Consulting, providing specialist ecological services for development and research.
- 2007 Present – Senior Scientist (Associate) – Plant Conservation Unit, Department of Botany, University of Cape Town.
- 2004-2007 – Senior Scientist (Contract) – Plant Conservation Unit, Department of Botany, University of Cape Town
- 2000-2004 – Specialist Scientist (Contract) - South African National Biodiversity Institute

- 1997 – 1999 – Research Scientist (Contract) – South African National Biodiversity Institute

A selection of recent work is as follows:

**Strategic Environmental Assessments**

Co-Author. Chapter 7 - Biodiversity & Ecosystems - Shale Gas SEA. CSIR 2016.

Co-Author. Chapter 1 Scenarios and Activities – Shale Gas SEA. CSIR 2016.

Co-Author – Ecological Chapter – Wind and Solar SEA. CSIR 2014.

Co-Author – Ecological Chapter – Eskom Grid Infrastructure SEA. CSIR 2015.

Contributor – Ecological & Conservation components to SKA SEA. CSIR 2017.

**Recent Specialist Ecological Studies of Wind Energy Facilities**:

Environmental Impact Assessment for the Proposed Komsberg East and Komsberg West Wind Farms and Associated Grid Connection Infrastructure: Fauna & Flora Specialist Impact Assessment. Arcus Consulting 2014.

Proposed Rietkloof & Brandvallei Wind Farms and Associated Grid Connection Infrastructure: Fauna & Flora Specialist Impact Assessment Report. EOH 2016.

Proposed Gunstfontein Wind Farm and Associated Grid Connection Infrastructure: Fauna & Flora Specialist Impact Assessment Report. Savannah Environmental 2016.

Mainstream South Africa Dwarsrug Wind Energy Facility: Fauna & Flora Specialist Impact Assessment Report. Sivest 2014.

Phezukomoya and San Kraal Wind Energy Facilities and associated grid connection. Fauna and Flora specialist studies. Arcus Consulting 2018.

Kokerboom Wind Energy Facilities (1-4) and associated grid connections. Fauna and Flora specialist studies. Aurecon 2017.

# Specialist Declaration

I, ..Simon Todd....., as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- 
- I act as the independent specialist in this application;
- I perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist: 

Name of Specialist: ____Simon Todd_____

Date: ____10 March 2019_____

# SPECIALIST FAUNA AND FLORA EIA STUDY

## 1. INTRODUCTION AND METHODOLOGY

## 1.1 SCOPE AND OBJECTIVES

Red Cap Energy (Pty) Ltd (Red Cap) has appointed Aurecon South Africa (Pty) Ltd (Aurecon) to undertake the required application for environmental authorisation process for the proposed Impofu West Wind Farm located near to Oyster Bay in the Eastern Cape Province. The Impofu West Wind Farm is one of three proposed adjoining wind farms being assessed for the Impofu Wind Farms Project. The other two wind farms are Impofu East and Impofu North and are each assessed separately. It is anticipated that the Impofu West Wind Farm would be comprised of up to 41 turbines of between 3-5MW each. The Scoping study has already been accepted by DEA and the development is currently in the EIA Phase. Red Cap Impofu West (Pty) Ltd has appointed 3Foxes Biodiversity Solutions to provide a specialist terrestrial biodiversity EIA Study of the development site as part of the EIA process.

The purpose of the Impofu West Terrestrial Biodiversity EIA Report is to describe and detail the ecological features of the proposed wind farm site; provide an assessment of the ecological sensitivity of the site and identify the likely impacts that may be associated with the development of the site as a wind energy facility. Several site visits (detailed in Section 1.1.3) as well as a desktop review of the available ecological information for the area was conducted in order to identify and characterise the ecological features of the site. This information is used to derive an ecological sensitivity map that presents the ecological constraints and opportunities for development at the site. The information and sensitivity map presented here provides an ecological baseline that has been used in the planning phase of the development to ensure that the potential negative ecological impacts associated with the development are minimised. Impacts are assessed for the Construction, Operational and Decomissioning phases of the development and a variety of mitigation measures that should be included in the EMPr are suggested to reduce the ecological impacts of the development even further. The full Scope of the study is detailed below.

***Terms of Reference***

The study includes the following activities:

- a description of the environment that may be affected by a specific activity and the manner in which the environment may be affected by the proposed project;
- a description and evaluation of environmental issues and potential impacts (including assessment of direct, indirect and cumulative impacts) that have been identified;
- a statement regarding the potential significance of the identified issues based on the evaluation of the issues/impacts;
- an indication of the methodology used in determining the significance of potential environmental impacts;
- an assessment of the significance of direct indirect and cumulative impacts of the development;

- a description and comparative assessment of all alternatives including cumulative impacts;
- recommendations regarding practical mitigation measures for potentially significant impacts, for inclusion in the Environmental Management Programme (EMPr);
- an indication of the extent to which the issue could be addressed by the adoption of mitigation measures;
- a description of any assumptions uncertainties and gaps in knowledge; and
- an environmental impact statement which contains:
- a summary of the key findings of the environmental impact assessment;
- an assessment of the positive and negative implications of the proposed activity; and
- a comparative assessment of the positive and negative implications of identified alternatives.

General Considerations for the study included the following:

- Disclose any gaps in information (and limitations in the study) or assumptions made.
- Identify recommendations for mitigation measures to minimise impacts.
- Outline additional management guidelines.
- Provide monitoring requirements, mitigation measures and recommendations in a table format as input into the EMPr for faunal or flora related issues.
- The assessment of the potential impacts of the development and the recommended mitigation measures provided have been separated into the following project phases:
    - Planning and Construction
    - Operational
    - Decommissioning

## 1.2 APPROACH & ASSESSMENT PHILOSOPHY

This assessment is conducted according to the 2014 EIA Regulations (Government Notice Regulation 982) in terms of the National Environmental Management Act (Act 107 of 1998) as amended (NEMA), as well as best-practice guidelines and principles for biodiversity assessment as outlined by Brownlie (2005) and De Villiers *et al*. (2005).

In terms of NEMA, this assessment demonstrates how the proponent intends to comply with the principles contained in Section 2 of NEMA, which amongst other things, indicates that environmental management should:

- (In order of priority) aim to: avoid, minimise or remedy disturbance of ecosystems and loss of biodiversity;
- Avoid degradation of the environment;
- Avoid jeopardising ecosystem integrity;
- Pursue the best practicable environmental option by means of integrated environmental management;
- Protect the environment as the people's common heritage;
- Control and minimise environmental damage; and

- Pay specific attention to management and planning procedures pertaining to sensitive, vulnerable, highly dynamic or stressed ecosystems.

Furthermore, in terms of best practice guidelines as outlined by Brownlie (2005) and De Villiers et al. (2005), a precautionary and risk-averse approach should be adopted for projects which may result in substantial detrimental impacts on biodiversity and ecosystems, especially the irreversible loss of habitat and ecological functioning in threatened ecosystems or designated sensitive areas: i.e. CBAs (as identified by systematic conservation plans, Biodiversity Sector Plans or Bioregional Plans) and Freshwater Ecosystem Priority Areas.

In order to adhere to the above principles and best-practice guidelines, the following approach forms the basis for the study approach and assessment philosophy:

- The study includes data searches, desktop studies, site walkovers / field survey of the property and baseline data collection, describing:
    - The broad ecological characteristics of the site and its surrounds in terms of any mapped spatial components of ecological processes and/or patchiness, patch size, relative isolation of patches, connectivity, corridors, disturbance regimes, ecotones, buffering, viability, etc.

In terms of **pattern**, the following will be identified or described:

***Community and ecosystem level***

- The main vegetation type, its aerial extent and interaction with neighbouring types, soils or topography;
- Threatened or vulnerable ecosystems (*cf. SA vegetation map/National Spatial Biodiversity Assessment, fine-scale systematic conservation plans, etc*).

***Species level***

- Species of Conservation Concern (SCC) (giving location if possible using GPS);
- The viability of an estimated population size of the SCC species that are present (including the degree of confidence in prediction based on availability of information and specialist knowledge, i.e. High=70-100% confident, Medium 40-70% confident, low 0-40% confident);
- The likelihood of other Red Data Book species, or SCC, occurring in the vicinity (include degree of confidence).

***Fauna***

- Describe and assess the terrestrial fauna present in the area that will be affected by the proposed development;
- Conduct a faunal assessment that can be integrated into the ecological study;
- Describe the existing impacts of current land use as they affect the fauna;
- Clarify species of special concern and that are known to be:
    - endemic to the region;
    - that are considered to be of conservational concern;
    - that are in commercial trade (CITES listed species); or
    - are of cultural significance.
- Provide monitoring requirements as input into the EMPr for faunal related issues.

***Other pattern issues***

- Any significant landscape features or rare or important vegetation associations such as seasonal wetlands, alluvium, seeps, quartz patches or salt marshes in the vicinity'
- The extent of alien plant cover of the site, and whether the infestation is the result of prior soil disturbance such as ploughing or quarrying (alien cover resulting from disturbance is generally more difficult to restore than infestation of undisturbed sites);
- The condition of the site in terms of current or previous land uses.

In terms of **process**, the following will be identified and/or described:

- The key ecological "drivers" of ecosystems on the site and in the vicinity, such as fire.
- Any mapped spatial component of an ecological process that may occur at the site or in its vicinity (i.e. *corridors* such as watercourses, upland-lowland gradients, migration routes, coastal linkages or inland-trending dunes, and *vegetation boundaries* such as edaphic interfaces, upland-lowland interfaces or biome boundaries).
- Any possible changes in key processes, e.g. increased fire frequency or drainage/artificial recharge of aquatic systems.
- Furthermore, any further studies that may be required during or after the EIA process will be outlined.
- All relevant legislation, permits and standards that would apply to the development will be identified.
- The opportunities and constraints for development will be described and shown graphically on an aerial photograph, satellite image or map delineated at an appropriate level of spatial accuracy.

## 1.3 FIELD ASSESSMENT

The field assessment component of the study took part in two phases. An initial 7-day site visit took place in September 2017. During this field assessment, the primary purpose of the field assessment was to map and ground-truth the ecological features of the study area in as much detail as possible so as to derive an accurate and reliable sensitivity map for the study area. This map was provided to the developer and has been used to inform the current layout of the development and ensure that sensitive features at the site are avoided at the planning stage. As such, the layout assessed in the current study was derived iteratively and can be considered to represent a mitigated layout which already takes the ecological features of the site into account. The second field assessment took place over two trips from 10-14 and 25-28 March 2018. The main purpose of the second field assessment was to characterise the affected ecosystems to a greater degree as well as verify in the field that all potential turbine locations (as per the conceptual design of 29 March 2018) were located within acceptable positions.

During the second field assessment period, small mammal trapping was conducted within various habitats at the site for a total of eight nights, giving rise to a total of 400 trap nights. In addition, 14 camera traps that had been put out across the whole Impofu Wind Farms study area (comprising the Impofu North, East and West Wind Farms) in September 2017 were retrieved and all images obtained processed and identified to species level. In addition to the small mammal trapping, reptile and amphibian searches and surveys were conducted within areas likely to be suitable for such species and all species observed were recorded.

Apart from the general site characterisation that was conducted, all turbine locations that were within or near to natural or near-natural vegetation were identified and each specifically visited and sampled in the field. A full vegetation survey was conducted at every turbine location that was not within transformed areas and all species within the footprint recorded. This was also facilitated by the fact that the turbine positions and hard-stands had been surveyed and pegged and were readily visible in the field. In addition, sections of the access roads and overhead lines that traversed intact or sensitive areas were checked in the field, and where necessary the sections walked in the field to check for the presence of sensitive features within the development footprint. Where such features were present these were mapped and recorded so that additional avoidance could be implemented if necessary.

## 1.4 SENSITIVITY MAPPING & ASSESSMENT

- An ecological sensitivity map of the site was produced by integrating the information collected on-site with the available ecological and biodiversity information available in the literature and various spatial databases. This includes delineating the different habitat units identified in the field and assigning sensitivity values to the units based on their ecological properties, conservation value and the observed presence of Species of Conservation Concern. The ecological sensitivity of the different units identified in the mapping procedure was rated according to the scale as indicated below.

Limits of acceptable change are also indicated below and refer to the extent of on-site habitat loss within each sensitivity category that is considered acceptable before significant ecological impact that is difficult to mitigate and which may compromise the development is likely to occur. This provides a guide for the developer in terms of ensuring that the spatial distribution of impact associated with a layout is appropriate with respect to the sensitivity of the site. In addition, it provides a benchmark against which impacts can be assessed and represents an explicit threshold that when exceeded indicates that potentially unacceptable impacts may have occurred. In terms of this latter criterion, exceeding the limits of acceptable change for either High or Very High sensitivity areas is considered to represent an immediate fatal flaw, while the limits within either Low or Medium sensitivity areas could potentially be exceeded, provided that the total footprint in these two areas combined does not exceed the overall combined acceptable loss within these classes. However, in the latter case, this would raise significant concern regarding the suitability of the development and the exact spatial configuration of the development and the likely impacts on ecological processes would need to be considered.

| Sensitivity | Acceptable Loss | Description |
|---|---|---|
| **Low** | 10% | Units with a low sensitivity where there is likely to be a low impact on ecological processes and terrestrial biodiversity. This category represents transformed or natural areas where the impact of development is likely to be local in nature and of low significance with standard mitigation measures. |
| **Medium** | 5% | Areas of natural or previously transformed land where the impacts are likely to be largely local and the risk of secondary impacts such as erosion low. Development within these areas can proceed with relatively little ecological |

| | | |
|---|---|---|
| | | impact provided that appropriate mitigation measures are taken. |
| **High** | 2% | Areas of natural or transformed land where a high impact is anticipated due to the high biodiversity value, sensitivity or important ecological role of the area. Development within these areas is undesirable and should only proceed with caution as it may not be possible to mitigate all impacts appropriately. |
| **Very High** | 1% | Critical and unique habitats that serve as habitat for rare/endangered species or perform critical ecological roles. These areas should be avoided as much as possible. Where these features need to be traversed, existing roads or disturbance footprints should be used as far as possible. A small extent of habitat loss along road edges and similar features is acceptable where avoidance is not possible, but significant impact to these features is usually considered to represent a fatal flaw. |
| **No-Go** | 0 | Critical and unique habitats that serve as habitat for rare/endangered species or perform critical ecological roles and which must be considered to represent no-go areas from a developmental perspective. There is no acceptable loss within these areas and they must be avoided by all infrastructure components. |

## 1.5 ASSUMPTIONS AND LIMITATIONS

The current report is based on the results of a series of site visits as well as a desktop study, which serves to reduce the limitations and assumptions required for the study. The site visits took place in September 2017, and March 2018 which covers the spring and late summer seasons, the major flowering times in the area. As already described, all proposed turbine locations within natural to near-natural vegetation were checked in the field and a full plant species list derived for each turbine position to ensure that the impacts associated with each proposed turbine are acceptable and there are no species of high conservation concern within the development footprint.

Many fauna are difficult to observe in the field and their potential presence at a site must be evaluated based on the literature and available databases. In many cases, these databases are not intended for fine-scale use and the reliability and adequacy of these data sources relies heavily on the extent to which the area has been sampled in the past. Many remote areas have not been well sampled with the result that the species lists derived for an area do not always adequately reflect the actual fauna and flora present at the site. In order to address this potential limitation, and better characterise the faunal community at the site, small mammal trapping using Sherman live traps was conducted over eight nights in March 2018 within different habitats including forest, dunes, rocky outcrops and riparian thicket at the site. Fourteen camera traps were also distributed across the broader Impofu Wind Farms study area site in September 2017 and retrieved in March 2018 and all images captured were processed and identified to species level.

Given the very detailed and extensive fieldwork that was conducted at the site, there are no features within the development footprint that would not have been observed and hence there is very little uncertainty with regards to the results of the field assessment and the sensitivity mapping.

## 1.6 SOURCE OF INFORMATION

Data sources from the literature consulted and used where necessary in the study includes the following:

*Vegetation:*

- Vegetation types and their conservation status were extracted from the South African National Vegetation Map (Mucina and Rutherford 2006 and 2012 update) as well as the National List of Threatened Ecosystems (2011), where relevant.
- Information on plant and animal species recorded for the area was extracted from the new Plants of South Africa (POSA) database hosted by the South African National Biodiversity Institute (SANBI). Data was extracted for a significantly larger area than the study area, but this is necessary to ensure a conservative approach as well as counter the fact that the site itself has not been well sampled in the past.
- The IUCN conservation status of the species in the list was also extracted from the database and is based on the Threatened Species Programme, Red List of South African Plants (2017).

*Habitats & Ecosystems:*

- Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas assessment, NFEPA (Nel et al. 2011).
- Critical Biodiversity Areas in the study area were obtained from the Eastern Cape CBA layer as well as the fine-scale plans for the Garden Route Initiative, the Nelson Mandela Bay Conservation Plan, the Baviaanskloof Initiative and the STEP Programme.

*Fauna:*

- Lists of mammals, reptiles and amphibians which are likely to occur at the site were derived based on distribution records from the literature and the Animal Demography Unit (ADU) databases http://vmus.adu.org.za.
- Literature consulted includes Branch (1988) and Alexander and Marais (2007) for reptiles, Du Preez and Carruthers (2009) for amphibians, EWT & SANBI (2016) and Skinner and Chimimba (2005) for mammals.
- The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site.
- The conservation status of mammals is based on the IUCN Red List Categories (EWT/SANBI 2016), while reptiles are based on the South African Reptile Conservation Assessment (Bates et al. 2013) and amphibians on Minter et al. (2004) as well as the IUCN (2017).

*Previous Specialist Studies:*

A number of specialist studies have been conducted for the other wind farm developments in the area. Confirmed records of fauna from these studies can be used to inform the current study and reduce uncertainty as to which species are likely to be present and their associated habitats. Studies that were reviewed included the following:

- Fauna and Flora study for the Banna ba Pifhu Windfarm near Humansdorp (Pote 2013)
- Fauna and Flora specialist study for the Jeffreys Bay Wind Farm (Bluesky 2010)
- Fauna specialist report (Marshall 2010) and vegetation specialist report (Pote 2010) for the Kouga and Gibson Bay Wind Farms
- Ecological Specialist studies for the Oyster Bay Wind Farm (Hoare 2011) and Tsitsikamma Community Wind Farm (Hoare 2011).
- Fauna and Flora specialist study for the Ubuntu Wind Energy Project (Pote 2012).

# 2. DESCRIPTION OF PROJECT ASPECTS RELEVANT TO ECOLOGICAL IMPACTS

The main infrastructural components of the Impofu West Wind Farm are described below to provide context as to the likely ecological impacts associated with the development.

***Turbines***

- Each turbine would have a circular foundation of approximately 20-25 m diameter, a temporary disturbed area including the foundation, the hardstand and construction area of approximately 100 x 50 m for use as a laydown area and to accommodate a crane pad during installation, with a permanent hardstand footprint of approximately 50 x 30 m remaining for maintenance purposes.

***Supporting Infrastructure***

- The supporting infrastructure within the site includes roads, underground and overhead medium voltage (MV) power lines (33 kV or lower), substations and various operations, control and storage buildings.
- The internal gravel roads will be approximately 6 m wide with potential side drains along the side. Where possible existing roads and cattle walkways will be used and upgraded to avoid additional clearance of natural or agricultural land cover. In exceptional circumstances short sections of the roads may be surfaced with bitumen or concrete if they are excessively steep.
- The wind farm application/s will include the 33 or lower kV MV lines that would transfer the power generated from the turbines to the on-site substation. These lines would predominantly be in the form of underground cables, but in cases where they have to cross complex terrain such as drainage lines or steep kloofs, they would be short sections of overhead power lines.
- The total footprint of the substation would be approximately 150 x 75 m (11,250 m2). The adjacent switching station is of the same size but has been assessed as part of the Grid Connection application.
- In order for heavy vehicles to access the site at construction, some upgrades to some of the public roads would also be required. This includes two river crossings on district road 1774 to the West of the Impofu West site.

# 3. DESCRIPTION OF THE AFFECTED ENVIRONMENT

## 3.1 VEGETATION TYPES

The vegetation of the area is described and mapped by the National Vegetation Map (Mucina & Rutherford 2006) as well as by Vlok et al. (2008) as part of the Garden Route Initiative. Although the map by Vlok provides greater detail than the VegMap, the current National List of Threatened Ecosystems relies largely on the 2006 VegMap and as such is the current underlying source of the legislation around threatened ecosystems. Both maps are provided here, but the descriptions are drawn from the Vegmap and then compared with the Vlok et al. map.

The majority of the Impofu West site consists of Tsitsikamma Sandstone Fynbos with a large extent of Southern Cape Dune Fynbos in the south. There are also smaller patches of Southern Afrotemperate Forest in kloofs and other sheltered positions and some narrow bands of Eastern Coastal Shale Band Vegetation and Garden Route Shale Fynbos which traverse the site (Figure 1). There is however no remaining intact Eastern Coastal Shale Band Vegetation or Garden Route Shale Fynbos within the site and it appears to have all been lost to agricultural transformation. Each of the above vegetation types is described below, including the characteristic and dominant species as reported in Mucina and Rutherford (2006). The actual species present at the site as observed during the field assessment are described in the next section (Section 1.3.2).

***Tsitsikamma Sandstone Fynbos***

Tsitsikamma Sandstone Fynbos has an extent of 2278 km$^2$ and occurs in the Western and Eastern Cape Provinces in the Tsitsikamma Mountains from Uniondale to Cape St Francis, and north of the Keurbooms River and south of Langkloof. The vegetation is medium dense, tall proteoid shrubland over a dense moderately-tall, ericoid-leaved shrubland of mainly proteoid, restioid and ericoid fynbos with fynbos thicket in wetter areas. It is associated with acidic lithosol soils derived from Ordovician sandstones and the Table Mountain Group. Land types are mainly Ib, Ca and Bb. Despite relatively high levels of transformation (over 33%) it is currently classified as Least Concern under the National List of Threatened Ecosystems (2011) and has not been identified as a priority vegetation type under the STEP Programme either. It is however relatively well conserved in the Garden Route National Park. Mucina and Rutherford (2006) list five endemic species to this vegetation type. Within Impofu West, the remaining areas of this this vegetation have been heavily impacted and there are no areas present within the study area that could be described as representing "*medium dense, tall proteoid shrubland over a dense moderately-tall, ericoid-leaved shrubland of mainly proteoid, restioid and ericoid fynbos*". The taller overstorey has been largely removed through the regular use of fire as a management practice to encourage grasses and improve the grazing value of the vegetation.

Characteristic and dominant species of this vegetation type include shrubs such as *Cliffortia serpyllifolia, Leucodendron conicum, L.eucalyptifolium, L.ulignosum subsp. glabrum, Leucospermum glabrum, Metalasia densa, M.trivialis, Mimetes pauciflorus, Passerina corymbosa, P.falcifolia, Protea eximia, P.mundi. P.nerifolia, Pterocelastrus tricuspidatus, Erica discolor, E.sparsa, Ursinia scariosa, Agathosma ovata, Anisodontea scabrosa, Aspalathus ciliaris, Berzelia intermedia, Carpacoce vaginella, Erica diaphans, E.glanddulosa, E.rosacea, E.uberiflora, Euryops*

*munitus, E.pinnatipartitus, Helichrysum teretifolium, Indigofera flabellata, Leucodendron salignum, L.spissifolium subsp. phillipsii, Otholobium carneum, Passerina pendula, Penaea cneorum subsp. gigantea, Phylica axillaris, P.imberbis, Protea cynaroides* and *Stoebe plumosa*. Herbs include *Commelina africana, Gazania krebsiana, Geissorhiza fourcadi, G.inconspicua* and *Romulea pratensis*. Graminoids include *Restio triticeus, Tetraria capillacea, Diheteropogon filifolius, Elegia juncea, Epischoenus adnatus, Heteropogon contortus, Hypodiscus synchroolepis. Tetraria robusta, Thamnochortus fruticosus, T.glaber, Themeda triandra* and *Tristachya leucothrix*.

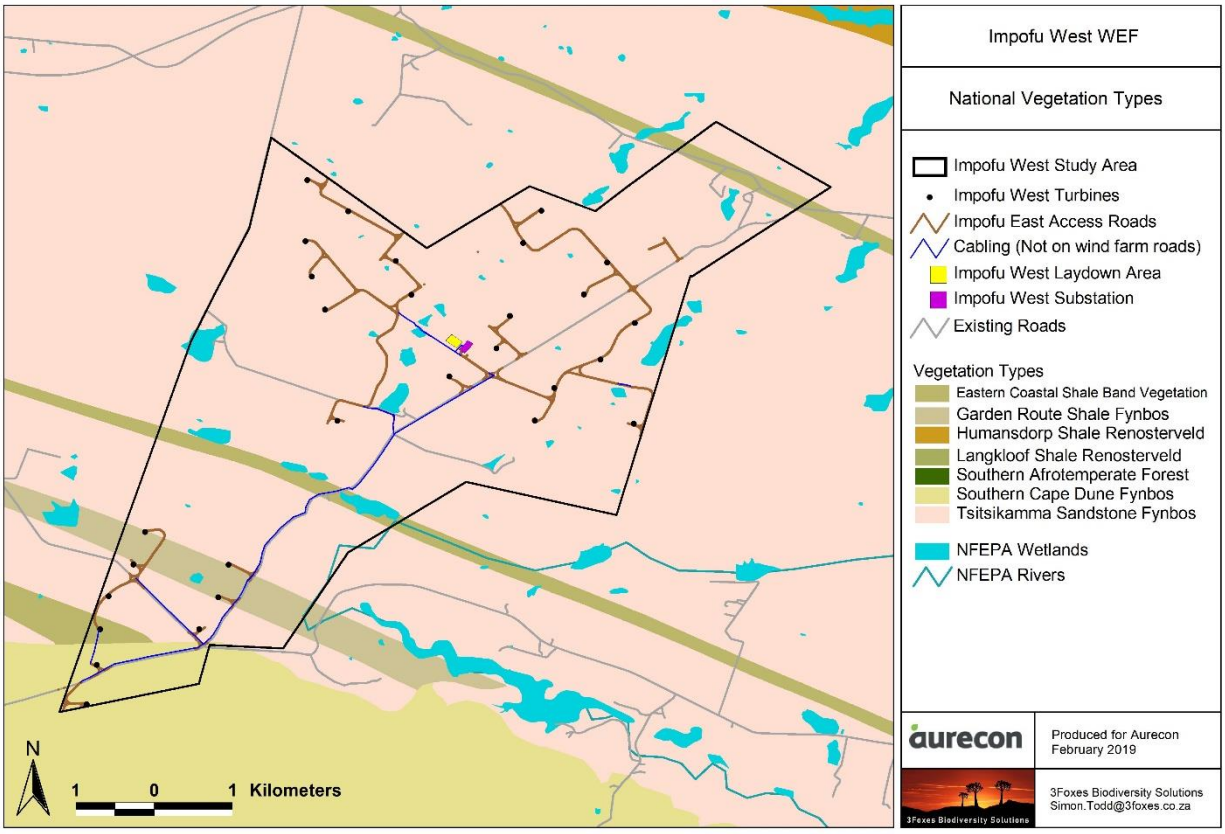


**Figure 1.** Vegetation map (Mucina and Rutherford 2006 and 2012 Powrie Update) of the Impofu West study area and surrounding area.

***Southern Cape Dune Fynbos***

Southern Cape Dune Fynbos occurs in the Western and Eastern Cape Provinces in two large mapped patches which span the Wilderness Estuary and Buffels Bay near Knysna in the Western Cape and the Tsitsikamma River mouth to Oyster Bay in the Eastern Cape. There are also some smaller cordons between Oyster Bay and Cape St Francis. It is associated with coastal dune systems, including several tall dune systems such as those near Groenvlei. The vegetation is a fynbos heath dominated sclerophyllous shrubs with a rich restio undergrowth. The dominant shrubs include *Olea exasperata* and *Phylica litoralis*, while *Ischyrolepis eleocharis* is also prominent. The exclusion of fire and large herbivores from these areas has enabled the invasion of woody thicket species such as *Pterocelastrus tricuspidatus*, *Searsia lucida*, *Sideroxylon inerme* and *Tarchonanthus littoralis*. It occurs on stabilised old calcareous or neutral dunes of deep sands

outside of the influence of salt spray. Soils are of the Lamotte form with land types mainly Hb and Ga. Although it is considered to be Least Threatened under the National List of Threatened Vegetation types, the STEP Programme identifies the affected area as consisting of the St Francis Dune Thicket habitat type and as Endangered. A significant proportion of the Western Cape part of this unit is conserved within the Goukamma and Huisklip Nature Reserves. In the Eastern Cape, it is partly conserved within Thyspunt, Rebelsrus and Klasies River Cave. Approximately 17% of the total extent has been lost to cultivation, plantations and urban development.

Dominant and characteristic shrubs include *Olea exasperata, Passerina corymbosa, Searsia crenata, S.glauca, S.laevigata, S.lucida, Agathosama ovata, Metalasia muricata, Passerina rigida, Phylica litoralis, Agathosma apiculata, A.stenopetala, Anthospermum aethiopicum, Aspalathus spinosa, Chironia baccifera, Erica fourcadi, E.glumiflora, E.zeyheriana, Felicia echinata, Gnidia anthylloides, Helichrysum teretifolium, Indigofera sulcata, Jamesbrittennia microphylla, Leucodendron salignum, Morella quercifolia, Muraltia satureioides. M.squarrosa, Otholobium bracteolatum, Pelargonium betulinum, Phylica ericoides, Polygala ericaefolia* and *Struthiola parviflora*. Forbs include *Satyrium princeps, Crytanthus loddigesianus* and *C.obliquus* while graminoids include *Ischyrolepis eleocharis, Ehrharta calycina, Ficinia dunensis, Ischryrolepis leptoclados, Pentaschistis heptamera, Tetraria cuspidata, Thamnochortus cinereus* and *Tribolium obtusifolium*.

***Southern Afrotemperate Forest***

Southern Afrotemperate Forest occurs in the Western and Eastern Cape with the largest complex found in the southern Cape along the coastal strip between Humansdorp in the east and Mossel Bay in the west where it occurs on sheltered seaward slopes, plateaux and coastal scarps. It consists of a tall multi-layered afrotemperate forests. Trees include *Afrocarpus falcatus, Cunonia capensis, Curtisia dentata, Nuxia floribunda, Ocotra bullata, Olinia ventrosa, Podocarus elongatus, P.latifolius, Pterocelastrus tricuspidatus, Rapanea melanophloeos, Ilex mitis, Olea capensis*. Small trees include *Canthium inerme, Cassine peragua, Diospyros whyteana*. Herbs and forbs incliude *Cyathea capensis, Buchellia bulbalina, Trichocladus crinitus, Sparrmannia aficana, Blechnum capense, B.tabulare, Dietes iridioides, Rumohra adiantiformis, Todea barbara, Oplismenus hirtellus*. It is classified as least threatened as many areas are conserved within the Garden Route National Park, Wilderness National Park and a variety of other protected forest areas.

***Garden Route Initiative Vegetation Map***

The extract of the Garden Route Initiative vegetation map, is illustrated below in Figure 2. At a broad level the vegetation units mapped are very similar to the Vegmap, within the Impofu West study area at least. The main difference is the greater level of detail and in particular the mapping of the riparian vegetation and forest along the drainage lines of the area. In the north of the site, the Tsitsikamma Sandstone Fynbos has been broken down into several units. Two of these are within the site, with Kouga Mesic Proteoid Fynbos in the far north and Oyster Bay Thicket-Grassy Fynbos across the rest of the site. These can be considered to represent plant communities of the greater Tsitsikamma Sandstone Fynbos vegetation unit. The field work at the site provides some support for these units, in particular the differentiation of the vegetation in the south and east from

the more typical proteoid fynbos on the mountainous terrain in the north and west. The Vegmap and the Vlok et al. (2008) map are informative at the coarse planning stage, and while the threat status of the different vegetation units is used to inform the sensitivity mapping, the information collected on-site is considered to represent the most reliable characterisation and description of the vegetation of the site.

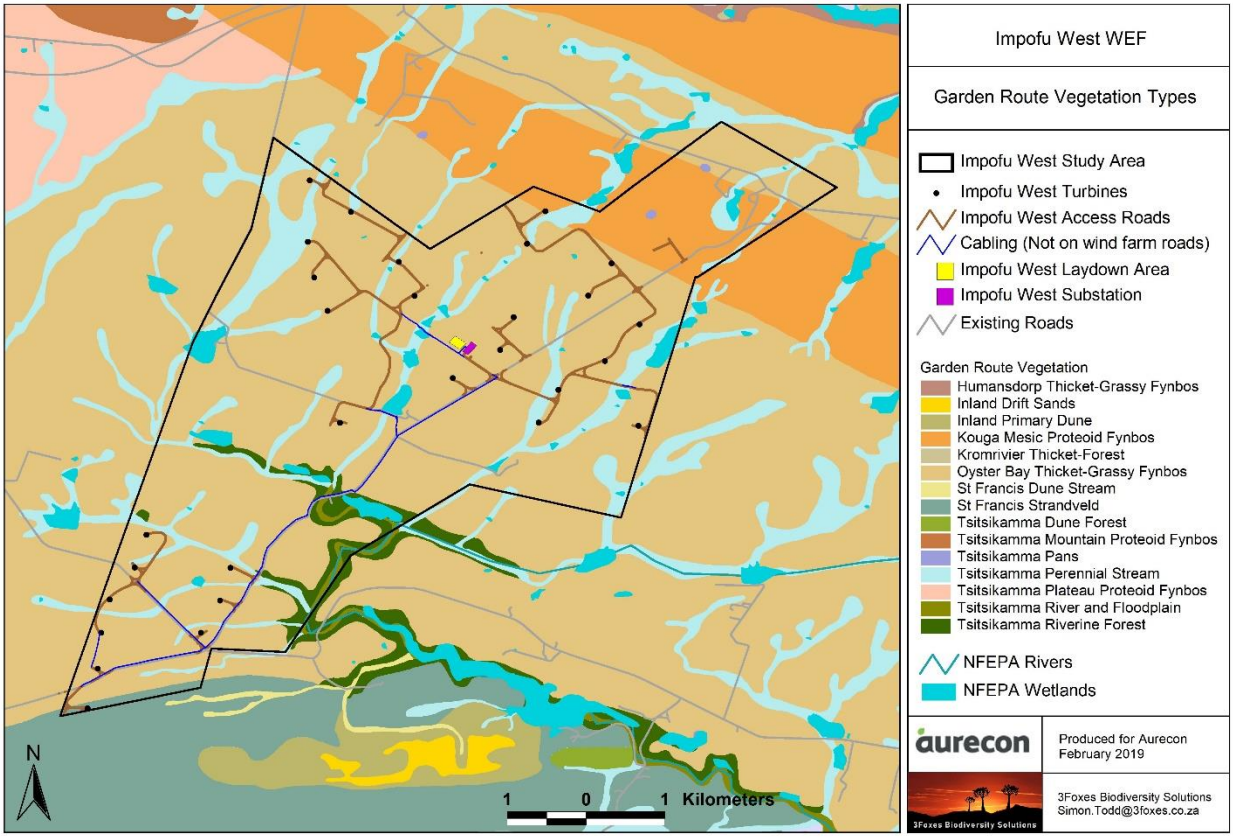


**Figure 2**. Extract of the vegetation map by Vlok et al. for the Garden Route Initiative.

## 3.2 IMPOFU WEST HABITAT DESCRIPTION

Although the Vegmap provides a broad overview of the vegetation of the area, at the site-scale it is not highly informative and does not provide an adequate description of the site. A number of different plant communities, habitats and vegetation types were recognised as present within the Impofu West WEF site, based on their species composition, structure and historical influences. Some of these are considered equivalent to the vegetation types present and are named as such, but several are not mapped as separate units in the Vegmap but can be recognised in the field as distinct units. The major units present are detailed and described below.

### *3.2.1 Southern Cape Dune Fynbos*

The southwestern margin of the Impofu West site consists of intact Southern Cape Dune Fynbos (Figure 3). This area includes various low dunes as well as the taller dunes along the boundary of the site and a series of wetlands in depressions between the dunes. This represents the only large contiguous area of intact habitat at the site and the majority of the areas south of the public road are considered highly sensitive. The areas in good condition have been classified as No-Go areas (see Figure 14) and are not considered suitable for development. There are however some degraded areas where poor management has led to significant degradation which are considered moderate sensitivity and where some development is considered acceptable.

Dominant and characteristic species observed in this area include *Elytropappus rhinocerotis*, *Stoebe plumosa*, *Passerina corymbosa, Leucospermum cuneiforme*, *Leucodendron salignum*, *Morella quercifolia*, *Gazania krebsiana*, *Ischyrolepis eleocharis*, *Hypoxis villosa*, *Aspalathus biflora*, *Aspalathus chortophila*, *Cliffortia ilicifolia*, *Agathosma apiculata*, *Erica canaliculata*, *E.discolor*, *Gladiolus maculatus*, *Gnidia galpinii*, *Hermannia althaeoides*, *Hibiscus aethiopicus*, *Lobelia coronopifolia*, *Pelargonium ovale* subsp. *ovale*, *Ehrharta calycina*, *Metalasia densa*, *Anthospermum spathulatum*, *Eragrostis capensis*, *Tristachya leucothrix*, *Pentaschistis pallida*, *Digitaria eriantha*, *Arctopus echinatus*, *Muraltia ericaefolia* and *Felicia echinata*. The condition of these areas is variable and there are some degraded areas with alien infestation or dominated by Bracken Fern *Pteridium aquilinum*, which appears to be the result of the excessive use of fire to improve the grazing value of the vegetation.

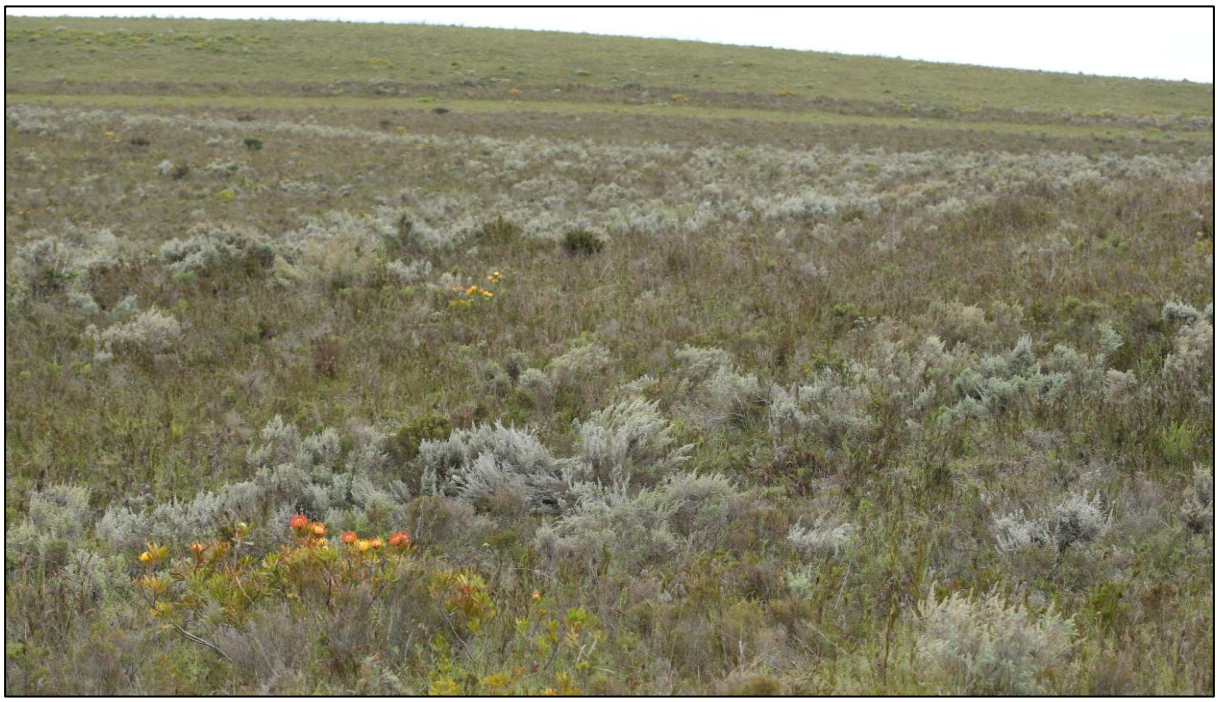

**Figure 3.** The southern part of the Impofu West site is the only extensive intact tract of the site and consists of Southern Cape Dune Fynbos. Although the major contiguous areas in the south is considered to be a No-Go area, there are also more disturbed fragments around the margin of the

intact area which are in a moderate to poor condition. The more disturbed areas as pictured here have a high abundance of disturbance indicators such as *Stoebe plumosa*.

### *3.2.2 Tsitsikamma Sandstone Fynbos*

Although the majority of the Impofu West site falls within the Tsitsikamma Sandstone Fynbos vegetation type, this unit has been significantly impacted by transformation and there is very little intact Tsitsikamma Sandstone Fynbos remaining within the site. There are some remnant intact areas in the north of the site, but these are highly degraded as a result of overgrazing and poor fire management (Figure 4, Figure 5). The plant diversity of these areas has been significantly impacted and they are currently dominated by various indicators of disturbance with a high abundance of alien species. Due to the degradation of these areas, they are generally considered to be of Medium sensitivity. Some areas of high sensitivity remain where there are wetlands embedded within these areas. Although these areas are degraded, they still play a role as habitat for fauna and retain much greater ecological function than the adjacent transformed areas. Although there are some turbines in these areas, this would not compromise their overall ecological functioning and habitat value.

These areas dominated by *Elytropappus rhinocerotis* and *Stoebe plumosa* with an understorey of species such as *Erica canaliculata*, *Erica cerinthoides*, *Gazania krebsiana*, *Restio triticeus, Ischyrolepis eleocharis*, *Leucospermum cuneiforme* and *Euryops munitus*.

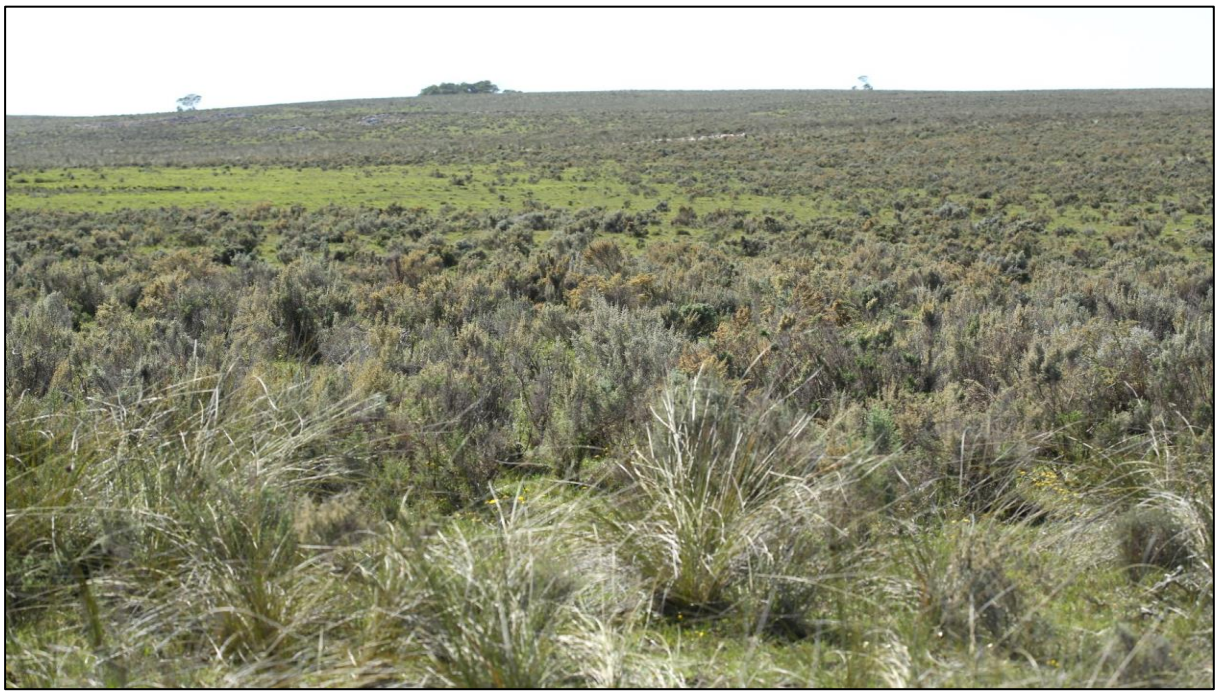

**Figure 4.** Highly degraded Tsitsikamma Sandstone Fynbos in the north of the Impofu West study area. This area has been severely impacted by excessive grazing pressure and some parts of this area may have been transformed in the past. Diversity of the remaining vegetation is low and this area is considered to be moderate to low sensitivity. The primary value of this area is for the maintenance of ecological connectivity and despite being degraded, it retains significantly greater ecological function that the adjacent croplands.

**Figure 5.** Remnant of Tsitsikamma Sandstone Fynbos within croplands within the Impofu West substation footprint. This area is also degraded and has been impacted by fires and grazing.

### *3.2.3 Croplands, Pastures and Transformed Areas*

A significant proportion of the site consists of croplands, pastures and previously ploughed areas used for the livestock grazing (Figure 6). The areas of croplands and irrigated pasture have low fauna and flora value and are not considered sensitive. In some areas, the fields have not been ploughed in some time and some limited recovery, especially of perennial grasses has occurred. The cropland areas and fields are used by some fauna as foraging habitat but their significance for fauna remains low. Development within these areas would generate low impacts and no significant impacts on fauna or flora from development in these areas is likely. The majority of the development footprint is within the transformed areas and this is the major contributing factor to the low overall impact associated with the development of the Impofu West Wind Farm. Species present on the old lands include *Pennisetum clandestinum*, *Eragrostis curvula*, *Plantago lanceolata*, *Cynodon dactylon*, *Conyza bonariensis*, *Seriphium plumosum* and *Pteridium aquilinum*.

**Figure 6.**The majority of the northern section of the Impofu West site has been transformed for croplands.

### *3.2.4 Southern Afrotemperate Forest*

There are numerous indigenous forest patches present across the site, associated with drainage lines, south-facing slopes and other moist or fire-protected habitats (Figure 7). While these are often fragmented or isolated within croplands, they remain important habitat for a variety of fauna including the Blue Duiker which is confirmed present at the site. These areas have been classified as No-Go areas It is however important to note that some of the wind farm access roads would traverse forested areas along existing roads which may need to be upgraded to meet the requirements of the wind farm. These sections that may need to be upgraded have been checked in the field and found to be acceptable and no significant loss of intact forest habitat would occur in these areas.

**Figure 7.** Indigenous forest patches occur along drainage lines, on steeper slopes and wetter areas within the site. These areas are considered highly sensitive and considered to be No-Go areas.

## 3.3 FAUNAL COMMUNITIES

### *3.3.1 Mammals*

According to the MammalMap database, more than 70 terrestrial mammals have been recorded from the broad area around the site. This does however include a variety of introduced extralimital and conservation-dependent species which are not relevant for the current study and the actual number of naturally-occurring mammals present is around 50. However, given the transformed status of large parts of the Impofu West study area, the actual number of species present within the site is likely to be significantly lower. Small mammals trapped in the Sherman traps include Four-striped grass mouse, Woodland Dormouse, Pygmy Mouse and Vlei Rat (Figure 8). Species observed within the consolidated Impofu Wind Farms area with the camera traps include Aardvark, Bat-eared Fox, Bushpig, Chacma Baboon, Black-backed Jackal, Caracal, Common duiker, Bushbuck, Cape Grysbok, Mountain Reedbuck, Large-spotted Genet, Cape Grey Mongoose, Honey Badger, Blue Duiker, Vervet Monkey, Cape Porcupine, Cape Clawless Otter, Cape Hare, Water Mongoose, Large Grey Mongoose and Yellow Mongoose (**Error! Reference source not found.**).

Species of conservation concern recorded or known to occur in the wider area include the African Striped Weasel *Poecilogale albinucha* (Near Threatened), Leopard *Panthera pardus* (Vulnerable), Cape Clawless Otter *Aonyx capensis* (Near Threatened), Mountain Reedbuck *Redunca fulvorufula* (Endangered) and Blue Duiker *Philantomba monticola* (Vulnerable). The Blue Duiker is associated with indigenous forest patches and is confirmed present at the site based on the results of the camera trapping. The forest patches are however classified as No-Go areas and

would not be impacted by the development. The Leopard would be restricted to the mountainous terrain north of the site and would not occur within the site itself. The Striped Weasel is also confirmed present at the site, based on the camera trapping but as only a single capture event occurred, this suggests that it is not common in the area and occurs at a low density. The Mountain Reedbuck was recorded within the intact Fynbos within the Impofu North site and is not likely to occur within the Impofu West WEF development area as there is little intact habitat present where this species would be able to find refuge. As a result any impact on this species is not at all likely. The Cape Clawless Otter is also confirmed present and occurs along the coast as well as along the drainage systems of the site, but may move extensive distances over dry land at times. Significant impact to the habitat of the otter is not likely as larger drainage features have been well-avoided by the layout.

**Figure 8.** Common small mammals trapped at the Impofu site include from top left, the Four-striped Grass Mouse, Woodland Dormouse and Pygmy Mouse.

Important habitats for mammals at the site more generally include the drainage lines and wetlands which occur across the site, the localised forest patches and the coastal dunes of the south. Although impact to these habitats would have high significance for mammals, these areas have been excluded from the development footprint. Avoidance of these habitats will ameliorate significant direct impact on mammals and a significant impact on any species or habitats of concern is not likely as a result. Significant impact on mammals is therefore considered unlikely and no species would be disproportionately impacted by the development. The primary impact of the Impofu West development on mammals would be a small amount of habitat loss within the natural and near-natural areas which occur within the development footprint. Some mammal species may be wary of the turbines or negatively affected by the noise generated and may avoid them to some degree. However, it is important to note that the majority of the site is within a relatively intensively-farmed area with relatively high levels of pre-existing anthropogenic noise with the result that the turbines would not be impacting an environment where the resident fauna are not already accustomed to some background level of noise disturbance. In addition, the noise generated by the turbines would occur concomitant with periods when the noise generated

by the wind itself is high, with the result that turbine noise would to some extent be masked by the wind or at the very least propagated more dominantly in the windward direction. Still periods which would be the most important periods for fauna that use sound for communication would remain quiet as the turbines only kick in at moderate wind speeds (Typically >10km/h). Regardless, it is however highly unlikely that the local or regional populations of any species would be compromised by the development and long-term impacts on mammals are likely to be low after mitigation.

**Figure 9.** Examples of camera trap images from the Impofu West site. Clockwise from the top left, Cape Grysbok, Bushbuck, Cape Porcupine, Bushpig, Cape Hare, Blue Duiker, Cape Clawless Otter, Common Duiker.

### *3.3.2 Reptiles*

The vicinity of the Impofu West study area has not been well sampled for reptiles in the past with the result that the species list obtained from the Virtual Museum for the study area contained less than 30 reptiles. As a result, the area of interest was expanded to include the whole affected degree square as well as that immediately north of the site. This increased the potential list of reptiles known from the wider area to around 70 species. Although it is clear that that site would not contain this many species, the main purpose is to provide an indication of the diversity of the wider area as well as ensure that a conservative approach is taken with regards to identifying which species are likely to be present within the site itself. Species observed at the site during the current study include Rhombic Night Adder, Cross-marked Snake, Cape Girdled Lizard, Cape Grass Lizard, Cape Skink, Variegated Skink and Common Ground Agama (Figure 10). Approximately 20 additional species have been recorded during previous EIA studies on the adjacent wind farms and provide a good indication that these species would be present on the Impofu West Wind Farm as well.

Listed species known from the area include the Elandsberg Dwarf Chameleon *Bradypodion taeniabronchum* (EN), FitzSimons' Long-tailed Seps *Tetradactylus fitzsimonsi* (VU), Saltmarsh Gecko *Cryptactites peringueyi* (CR) and Karoo Padloper *Chersobius boulengeri* (NT). None of these species were observed at the site and no suitable habitat is present at the site for the Saltmarsh Gecko, although it is possible that the other three species may be present. The development footprint within intact areas is however low and even if present, the impact on these species and their habitat would be low.

The most important habitats for reptiles at the site include the intact Dune Fynbos in the south of the site, the riparian areas along the drainage lines of the site and intact forest and thicket patches that occur scattered across the site. The majority of the site is however previously transformed and consists of croplands and pastures that have low reptile habitat value. Overall, impacts on reptiles from the development of the Impofu West Wind Farm are likely to be low as the majority of the development footprint is located within the previously transformed or degraded habitats. There are no reptile SCC that are likely to be significantly affected by the development and no important reptiles habitats that would be significantly impacted by the development.

**Figure 10**. Common reptiles observed at the Impofu West site include from the top, the Cross-marked Grass Snake, Rhombic Night Adder and the Cape Girdled Lizard.

### *3.3.3 Amphibians*

A total of 22 frog species have been recorded from the broader area around the Impofu West site. Only one listed species, Hewitt's Ghost Frog (CR), is known from the area, but this species is restricted to a few mountainous streams in the Elandsberg Mountains and does not occur within or near the site. Species observed at the site include Cape River Frog, Common Caco, Bronze Caco and Raucous Toad (Figure 11). There are numerous earth dams, wetlands and drainage lines present at the site which represent the most important habitats for frogs. In general these areas have been well-buffered and apart from occasional access routes which must traverse drainage lines, impact to wetland features would be minimal. There are also various depressions and other features present across the site that hold species less dependent on water such as cacos and toads.

Due to the avoidance of aquatic features, impacts on frogs and frog habitats would be relatively low and no significant impacts on any particular species or habitats would occur.

**Figure 11.** Frogs observed at the Impofu West site include from top right, Common Caco, Cape River Frog and Raucous Toad.

## 3.4 CRITICAL BIODIVERSITY AREAS

The extract of the Garden Route CBA map for the study area is illustrated below in Figure 12. The map indicates that the large intact section of the site in the southwest is classified as a CBA, while there are various other smaller more fragmented CBAs scattered across the rest of the site. Based on the map there appear to be numerous turbines within the CBAs. However, there has been significant land-use change since the map was made and many of the turbines within areas classified as CBA are in areas that have since been transformed. The remaining turbines within natural to near-natural vegetation were all verified in the field and occur within areas that are degraded and where some habitat loss would not result in a significant decline in ecosystem function within the broader near-intact vegetation remnants. In terms of the areas classified as CBAs which have since been transformed, these areas no longer contain any biodiversity of significance and due to the transformation that has taken place, the underlying reasons these areas were classified as CBAs have been lost. Development within these areas is therefore not considered to have a significant impact on CBAs as there is no remaining biodiversity of significance and development within these areas would not disrupt ecological processes.

Due to the poor condition of the intact CBAs that would be impacted as well as the changes in land use that have taken place, the overall impact on the CBAs would be low. As a result, a significant loss of biodiversity within the CBAs is highly unlikely and the potential for a disruption of ecological processes is also low. Residual impacts on CBAs could be mitigated through improved management of the remaining intact areas which are currently facing significant threats from alien invasion, overgrazing and poor management.

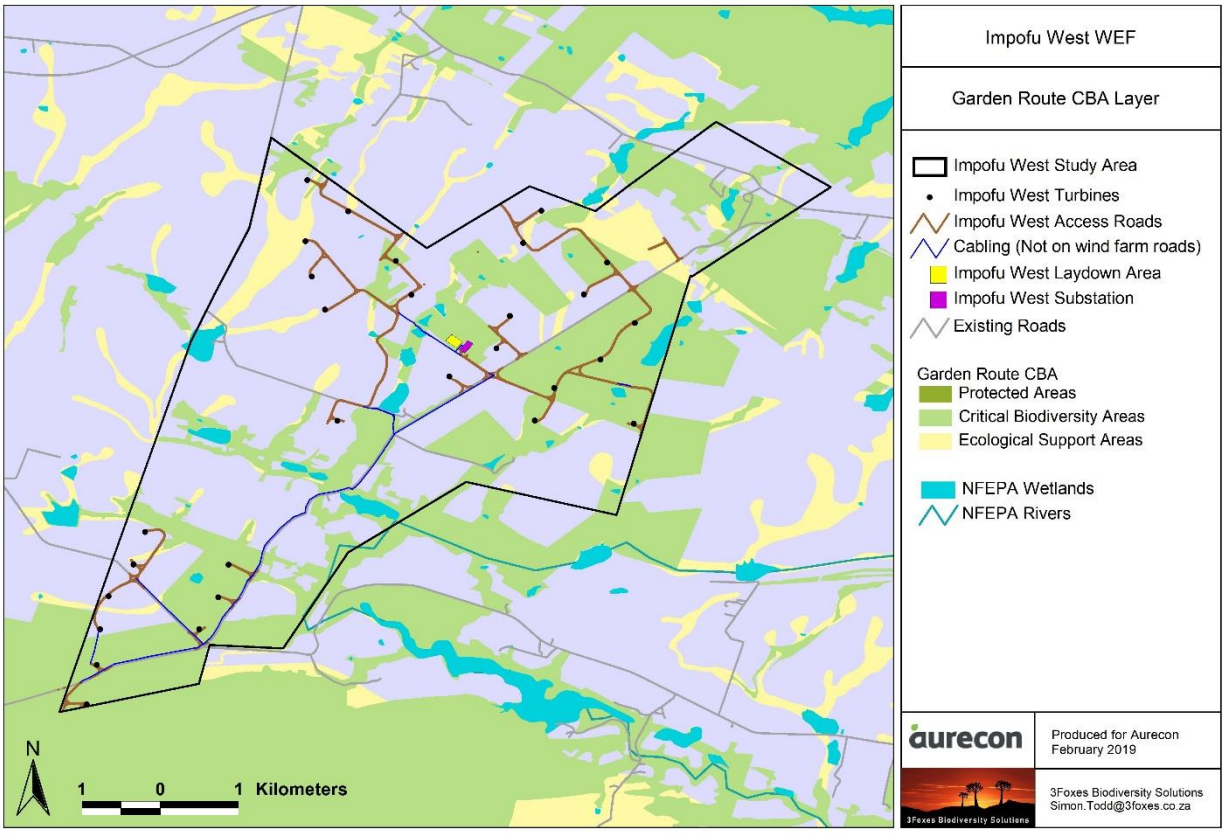


**Figure 12.** Critical Biodiversity Areas map for the Impofu West study area, showing the extensively transformed nature of the site apart from the intact dune area in the south.

## 3.5 CURRENT BASELINE & TRANSFORMATION CONTEXT

The Impofu Wind Farms project, comprising Impofu North, East and West, is located near to Oyster Bay in the Eastern Cape, within an area that currently used for intensive and extensive livestock farming with cattle and to a lesser degree small stock. A significant proportion of the landscape, especially towards to the coast has been transformed for pasture and crop production. There are also numerous other existing and planned wind farm developments in the area. The existing Tsitsikamma Community Wind Farm, Gibson Bay and Kouga Wind Farms are adjacent to the Impofu Wind Farm site, whilst the Jeffreys Bay Wind Farm is located east of the Impofu Wind Farm site near the town of Jeffreys Bay. See Figure 13 which shows the existing and planned wind farm projects in the Impofu site study area. The large degree of transformation the area has experienced has both positive and negative implications for the development of the site. The large amount of transformed habitat present in the area represents a development opportunity for the

current development as ecological impacts associated with development within such transformed habitats are very low. However, the large amount of transformation the area has experienced also means that the remaining intact vegetation is generally of high value and the remaining intact areas are vulnerable to both cumulative impacts as well as the disruption of broad-scale ecological processes such as dispersal. The development context of the site and the contribution of wind farm development to transformation and associated ecological impacts in the area is explored in greater detail below.

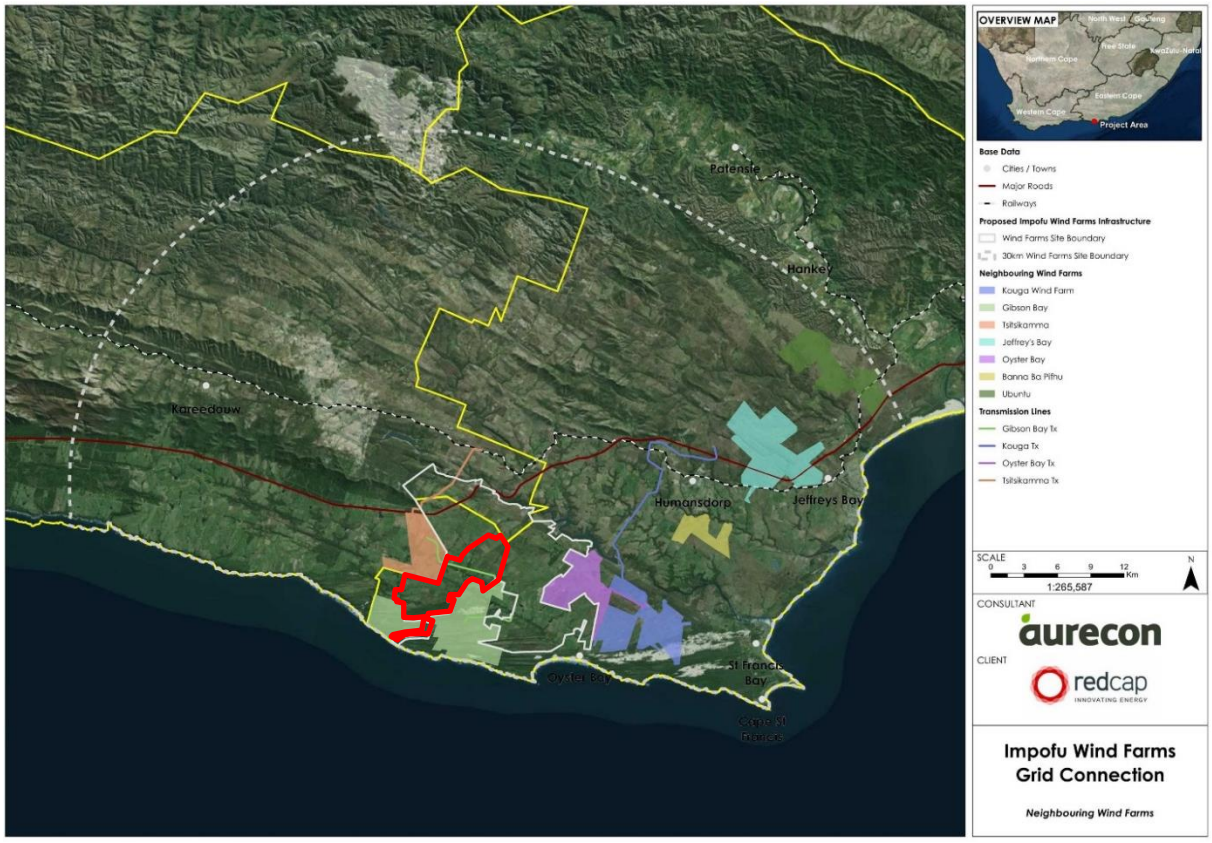


**Figure 13**. Map of other wind farm developments in the wide area around the Impofu West site indicated in red.

### *3.5.1 Current Context and Contribution of Wind Farm Development to Ecological Impact*

In terms of the existing development baseline, the Kouga Wind Farm is located immediately east of the Impofu West. The existing wind farms are considered most significant in terms of evaluating the potential contribution of the Impofu West Wind Farm to cumulative impact as these other developments have already been built and thus there is no uncertainty as to their presence and contribution towards cumulative impacts into the future. Proximity to the current site is also considered to be an important contributor to cumulative impact as the affected environment becomes increasingly different as one moves away from the site. In addition, the footprint within intact vegetation and especially Tsitsikamma Sandstone Fynbos and Southern Cape Dune Fynbos are seen as key indicators of cumulative impact when considering the Impofu West site. In the immediate vicinity of the site is the Kouga Wind Farm immediately east of the Impofu West site and the Gibson Bay Wind Farm immediately west of the site. The impact of the Kouga Wind Farm on

terrestrial ecosystems is seen as low, as the impact on natural to near natural habitats from this development was very low. The Gibson Bay Wind Farm has had a larger impact on intact Southern Cape Dune Fynbos and the extent of habitat loss from this development is estimated at 50ha of natural to near-natural vegetation, which. The contribution of the Impofu West Wind Farm to habitat loss within the Southern Cape Dune Fynbos vegetation type is considered to represent a moderate local impact. The Tsitsikamma Community Wind Farm is located 5 km west of the site and is located on Tsitsikamma Sandstone Fynbos which would also be affected by the Impofu West WEF. The contribution of the Tsitsikamma Community Wind Farm to habitat loss is estimated at not more than 30ha. The Jeffreys Bay Wind Farm is located approximately 20 km east of the Impofu West site, but the vegetation of this area is Kouga Grassy Sandstone Fynbos and the impacts in this area are considered to be somewhat less relevant to the baseline status of the Impofu Project area.

Given the nature and extent of the impact of the above wind farms on the natural environment, the overall current levels of habitat loss resulting from wind farm development can be seen to be relatively low compared to other sources. The major driver and contributor to existing impact is agricultural transformation for croplands. Wind farm development has had a relatively minor role to date and accounts for less than 5% of the total transformation the area has experienced. The extent and distribution of habitat loss that has occurred to date is however important to consider as this provides an indication of existing impact as well as the vulnerability of the system to further impact. Overall, the ecological baseline for the area indicates that the area should be considered to be significantly impacted by transformation and the remaining intact corridors should be considered especially important for the maintenance of ecological functioning of the landscape. As such, these should not be further fragmented or disrupted by development of any kind. By the same token, the large extent of transformed habitat in the area means that much development of these areas can take place within minimal ecological consequence.

The primary driver of habitat loss and cumulative ecological impact in the area is transformation for agricultural production. Due to the high existing levels of transformation for agriculture, the area is considered vulnerable to further impact and it is likely that some ecological processes such as dispersal ability of some species has already been compromised. To date, the additional contribution of wind farm development to direct habitat loss has been low in comparison to that which has resulted from agriculture. The potential contribution of the Impofu West Wind Farm to existing impact is considered to be low and there do not appear to be any fauna or flora present within the Impofu West site that would be particularly impacted or vulnerable to wind farm development given the layout that has been provided for assessment. No areas of high value habitat would be impacted by the development and any impacts on near-natural vegetation could be easily offset through improved management of the natural areas surrounding the development footprint. As such, the post-mitigation contribution of the Impofu West Wind Farm to cumulative impacts would be low.

As mentioned, the existing wind farms in the area are considered to inform the baseline status of the area. Similarly, the impacts associated with these existing wind farms is also used to inform the likely impacts associated the current development (Section 6.1). The existing distribution of impact in relation to the location of the current site is also considered to be an important factor in evaluating cumulative impact as the affected environment becomes increasingly different as one moves away from the site. In addition, the existing baseline impact within intact vegetation and especially

Tsitsikamma Sandstone Fynbos and Southern Cape Dune Fynbos are seen as key indicators of cumulative impact when considering the Impofu West site (see Section 6.2).

## 3.6 SITE SENSITIVITY ASSESSMENT

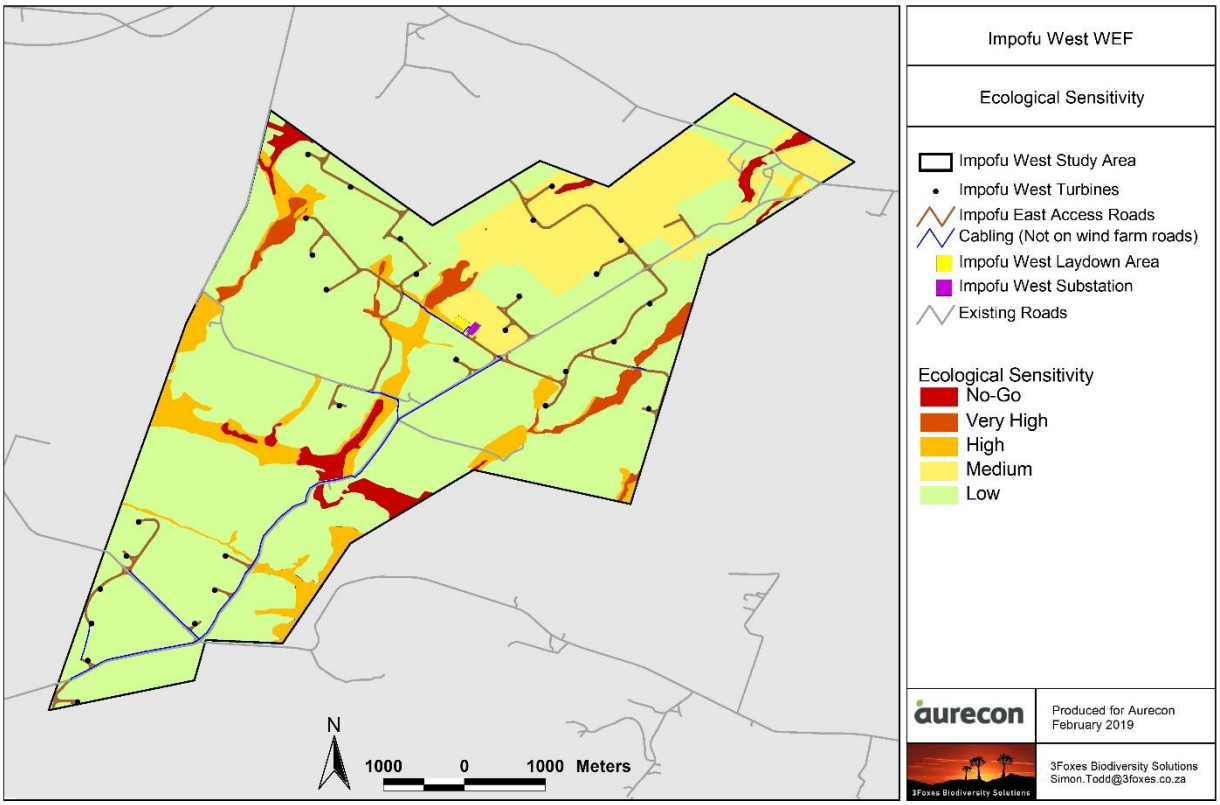


**Figure 14**. Ecological sensitivity map for the Impofu West study area, showing the high level of transformation that the area has experienced and the large remaining intact area of Dune Fynbos in the south which is considered the most important and sensitive part of the site.

The ecological sensitivity map for the study area is illustrated above in Figure 14. The majority of the site consists of previously transformed areas considered to be low sensitivity. There are some remaining forest patches and drainage systems present within the site, which are considered high sensitivity. Where access roads traverse these features, this is along existing road alignments or through degraded areas that have been verified in the field. This includes the two river crossings along the district road 1774, which have been checked and would not generate significant impact to the terrestrial environment. Additional mitigation to limit impact on freshwater systems from these activities is recommended in the freshwater study and is not repeated here. Within the site, the high sensitivity areas have been avoided by the development and there are no turbines in areas considered unsuitable for wind farm development. It is important to note that the current layout has been achieved through an iterative process and the layout assessed here has been developed in response to the sensitivity map presented here, which has in turn been extensively verified and validated in the field. As such, there is little uncertainty with regards to the sensitivity mapping at the

site and this is important in providing confidence with regards to the predicted impacts of the development on the ecological features of the site.

**Table 1.** The extent of the development footprint within the different sensitivity categories of the site.

| Sensitivity | Acceptable Loss (%) | Site Extent (ha) | Development Footprint (Ha) | Loss (%) |
|---|---|---|---|---|
| Low | 10% | 1967 | 34 | 1.73 |
| Medium | 5% | 356.84 | 8.4 | 2.35 |
| High | 2% | 201.05 | 1.31 | 0.65 |
| Very High | 1% | 58.56 | 0.07 | 0.1 |
| No-Go | 0 | 98.2 | 0 | 0 |

The extent of the development footprint within each of the sensitivity classes is indicated above in Table 1. The extent of footprint within each class is well within the specified acceptable limits and as such, there are no fatal-flaws from a purely technical standpoint in terms of the sensitivity mapping. Although there is a very small footprint within the Very High sensitivity areas, this is acceptable because this is considered a worst-case scenario as these areas are largely along existing alignments or due to underground cabling which in many cases could be traversed by overhead lines and not underground cabling, The final areas where underground cabling is considered acceptable and where overhead lines should be used to traverse these features would be determined at the preconstruction stage following a walk-through of the final development footprint. The overall acceptability of the development should also be considered in terms of general ecological and cumulative impacts across all habitat types and sensitivity classes. However, given the avoidance of no-go areas and sensitive features at the site under the final mitigated layout and the relatively low estimated footprint, this is also well within the stated acceptable limits and no high post- mitigation impacts are likely to occur as a result of the development.

# 4. IDENTIFICATION OF KEY POTENTIAL IMPACTS

## 4.1 ECOLOGICAL IMPACTS ASSOCIATED WITH THE IMPOFU WEST WIND FARM

The development of the Impofu West Wind Farm will result in a number of ecological impacts on fauna and flora associated largely with the transformation and loss of currently intact habitat. The intensity and ultimately the significance of these impacts is closely allied to the distribution of impact and transformation in relation to the sensitive receptors of the site, which is considered in greater detail below.

The specific additional contribution of the Impofu West Wind Farm to habitat loss within Tsitsikamma Sandstone Fynbos is conservatively estimated at less than 5ha while the extent of habitat loss within the Southern Cape Dune Fynbos vegetation type is also estimated at less than 5ha. The remaining footprint is within areas that are currently used as pasture or croplands and are not considered to have significant value for most terrestrial biodiversity. While some fauna use the transformed areas as foraging habitat or traverse these areas between intact habitat patches, such species are not likely to be sensitive to the wind farm development as it will generate little differentiation from the existing farming landscape in terms of obstacles to movement or habitat quality. Provided that the footprint of the infrastructure is outside of the intact areas, there is also little collateral impact on adjacent intact areas apart from the noise generated by the turbines when operating. This does not appear to have a significant impact on most fauna although there are some species which rely on hearing for mate recognition, food location or predator avoidance that may be locally affected by turbine noise.

The extent of direct habitat loss resulting from the assessed layout of the Impofu West development is considered to represent a relatively low impact. This represents a significant reduction from initial layouts and results directly from the avoidance that has been implemented in terms of avoiding intact and good condition vegetation as far as possible. The overall contribution of the Impofu West Wind Farm to impacts on ecological patterns and processes is likely to be low. There are no existing intact ecological corridors that would be disrupted by the wind farm infrastructure and there do not appear to be any fauna or flora present within the site that would be particularly impacted or vulnerable to the wind farm development given the layout that has been provided for assessment. The recommended No-Go areas have been adhered to by the current layout and there are no areas of high value habitat that would be impacted by the Impofu West development. The residual impacts on near-natural vegetation could be offset through improved management of the natural areas surrounding the development footprint.

The following potential impacts are identified as potentially resulting from the development and which will be assessed during the EIA phase of the assessment:

#### *4.1.1 Construction Phase*

- Impacts on vegetation and plant species of conservation concern
- Direct and indirect faunal impacts

#### *4.1.2 Operational Phase*

- Increased soil erosion
- Increased alien plant invasion
- Impacts on Fauna
- Impacts on Critical Biodiversity Areas

#### *4.1.3 Cumulative impacts*

- Cumulative impacts on habitat loss and broad-scale ecological processes

#### *4.1.4 Decommissioning Phase*

- Alien plant invasion
- Faunal Impacts

#### *4.1.5 No-Go Alternative*

The No-Go Alternative will be considered in the EIA phase. This entails consideration of what would happen to the site if the development does not go ahead and the current trends in land use continue on their current trajectories.

# 5. IMPACT ASSESSMENT CRITERIA

A summary of the impact assessment approach and methodology is provided below. A full description of the methodology is provided in the main Scoping Report and is not repeated in full here.

For each predicted impact, certain criteria are applied to establish the likely significance of the impact, firstly in the case of no mitigation being applied and then with the most effective mitigation measure(s) in place. These criteria include the intensity (size or degree scale), which also includes the type of impact, being either a positive or negative impact; the duration (temporal scale); and the extent (spatial scale). The consequence of the impact is calculated as follows:

**Consequence = type x (intensity + duration + extent).**

To calculate the significance of an impact, the probability (or likelihood) of that impact occurring is applied to the consequence.

**Significance = consequence x probability**

Depending on the numerical result, the impact would fall into a significance category as negligible, minor, moderate or major, and the type would be either positive or negative.

# 6. IMPACT ASSESSMENT

The assessment of impacts and recommendation of mitigation measures to be applied to reduce impacts is detailed below

# 6.1 ECOLOGICAL IMPACTS ASSOCIATED WITH THE IMPOFU WEST WIND FARM

The various impacts identified above as being associated with the development of the Impofu West Wind Farm are assessed below for the different phases of development, from construction through to decommissioning. The impacts are assessed before and after the implementation of recommended mitigation measures aimed at reducing the impacts of the development. It is

important to note that the assessment does not consider the avoidance that has been implemented by the developer to date resulting from the detailed screening and iterative design process that has been undertaken. The level of avoidance of High sensitivity and No-Go areas that has already been implemented by the developer (and reflected in the current layout design) has reduced the pre-mitigation significance of the predicted impacts considerably. As such, the mitigation measures recommended are additional measures that should be implemented to further reduce the impacts of the development. Due to the avoidance that has been implemented, the pre-mitigation impacts are generally relatively low compared to what they would have been without such avoidance. This is highlighted here to point out that the layout represents a mitigated-layout that takes account of the ecological sensitivities identified at the site. In addition, the recommended mitigation measures are not always effective at significantly reducing the impacts further due to residual impacts that cannot be avoided or because the pre-mitigation impacts are already considered low due to the avoidance implemented.

### *6.1.1 Construction Phase Impact 1. Impacts on vegetation and plant species of conservation concern*

The abundance of plant species of conservation concern at the site is relatively low, with few SCC present across the majority of the site. As a result, there is not a significant risk to the local populations of such species and the major impact is likely to result from the loss of some currently intact vegetation within those parts of the footprint where some intact vegetation remains. The major impact would result from some of the access roads which traverse sections of natural vegetation rather than the turbines themselves which are mostly located within transformed areas.

| Project phase | Construction | | | |
|---|---|---|---|---|
| Impact | Impacts on vegetation and plant SCC | | | |
| Description of impact | Impact on vegetation and plant SCC due to construction-phase habitat loss. | | | |
| Mitigatability | Medium | Mitigation exists and will notably reduce significance of impacts | | |
| Potential mitigation | -Preconstruction walk-through of the development footprint to further refine the layout and reduce impacts on SCC through micro-siting of the turbines and access roads.<br>-Minimise the development footprint as far as possible and rehabilitate disturbed areas after construction. | | | |
| Assessment | Without mitigation | | With mitigation | |
| Nature | Negative | | Negative | |
| Duration | Permanent | Impact may be permanent, or in excess of 20 years | Permanent | Impact may be permanent, or in excess of 20 years |
| Extent | Local | Extending across the site and to nearby settlements | Local | Extending across the site and to nearby settlements |
| Intensity | Low | Natural and/ or social functions and/ or processes are somewhat altered | Low | Natural and/ or social functions and/ or processes are somewhat altered |
| Probability | Almost certain / Highly probable | It is most likely that the impact will occur | Likely | The impact may occur |
| Confidence | High | Substantive supportive data exists to verify the assessment | High | Substantive supportive data exists to verify the assessment |
| Reversibility | Low | The affected environment will not be able to recover from the impact - permanently modified | Low | The affected environment will not be able to recover from the impact - permanently modified |
| Resource irreplaceability | Medium | The resource is damaged irreparably but is represented elsewhere | Low | The resource is not damaged irreparably or is not scarce |
| Significance | Moderate - negative | | Minor - negative | |
| Comment on significance | While there is some scope for avoidance of sensitive species and habitats, some vegetation loss is an inevitable consequence of development that cannot be avoided. | | | |
| Cumulative impacts | The area is considered vulnerable to cumulative impacts on vegetation, but the contribution of the Impofu North Wind Farm to such cumulative impacts is considered low because the majority of the development footprint is located within transformed areas. The total extent of habitat loss within natural to near-natural vegetation is conservatively estimated at 10ha. | | | |

### *6.1.2 Construction Phase Impact 2. Direct and indirect faunal impacts*

The construction of the development will result in significant habitat loss, noise and disturbance on site. This will lead to direct and indirect disturbance of fauna. Some slow-moving or retiring species such as many reptiles would likely not be able to escape the construction machinery and would be killed. There are also several species present at the site which are vulnerable to poaching and there is a risk that these species may be targeted. This impact would be caused by the presence and operation of construction machinery and personnel on the site.

| **Project phase** | **Construction** | | | |
|---|---|---|---|---|
| **Impact** | **Direct and indirect faunal impacts** | | | |
| **Description of impact** | Construction phase impact on fauna | | | |
| **Mitigatability** | Medium | Mitigation exists and will notably reduce significance of impacts | | |
| **Potential mitigation** | - Avoidance of identified areas of high fauna importance at the design stage (as has been achieved with the current layout).<br>- Search and rescue for reptiles and other vulnerable species during construction, before areas of intact vegetation are cleared.<br>- Limiting access to the site and ensuring that construction staff and machinery remain within the demarcated construction areas during the construction phase.<br>- Environmental induction for all staff and contractors on-site. | | | |
| **Assessment** | **Without mitigation** | | **With mitigation** | |
| **Nature** | Negative | | Negative | |
| **Duration** | Short term | impact will last between 1 and 5 years | Short term | impact will last between 1 and 5 years |
| **Extent** | Local | Extending across the site and to nearby settlements | Local | Extending across the site and to nearby settlements |
| **Intensity** | Moderate | Natural and/ or social functions and/ or processes are moderately altered | Moderate | Natural and/ or social functions and/ or processes are moderately altered |
| **Probability** | Almost certain / Highly probable | It is most likely that the impact will occur | Likely | The impact may occur |
| **Confidence** | High | Substantive supportive data exists to verify the assessment | High | Substantive supportive data exists to verify the assessment |
| **Reversibility** | Medium | The affected environment will only recover from the impact with significant intervention | High | The affected environmental will be able to recover from the impact |
| **Resource irreplaceability** | Low | The resource is not damaged irreparably or is not scarce | Low | The resource is not damaged irreparably or is not scarce |
| **Significance** | **Minor - negative** | | **Minor - negative** | |
| **Comment on significance** | While there is some scope for avoidance of sensitive habitats, some disturbance and habitat loss is an inevitable consequence of development that cannot be entirely avoided. | | | |
| **Cumulative impacts** | Cumulative impacts on fauna are predicted to be to low because the majority of the development footprint is within transformed habitats and there are no parts of the development footprint within areas identified as being of very high faunal value. | | | |

### *6.1.3 Operational Phase Impact 1. Operational Impacts on Fauna*

Operational activities as well as the presence of the turbines and the noise they generate may deter some sensitive fauna from the area. In addition, the access roads may function to fragment the habitat for some fauna, which are either unable to unwilling to traverse open areas. Subterranean species such as Golden Moles and burrowing snakes and skinks are particularly vulnerable to this type of impact as they are unable to traverse the hardened roads or become very exposed to predation when doing so. This is a low-level continuous impact which can generate a cumulative impact on sensitive species.

| **Project phase** | **Operation** | | | |
|---|---|---|---|---|
| **Impact** | **Operational phase faunal impacts** | | | |
| **Description of impact** | Operational phase impacts on fauna | | | |
| **Mitigatability** | Medium | Mitigation exists and will notably reduce significance of impacts | | |
| **Potential mitigation** | - Open space management plan to inform the EMPR for the development, which makes provision for favourable management of the facility and the surrounding area for fauna.<br>- Limiting access to the site to staff and contractors only.<br>- Appropriate design of roads and other infrastructure where appropriate to minimise faunal impacts and allow fauna to pass through or underneath these features.<br>- No electrical fencing within 20cm of the ground as tortoises become stuck against such fences and are electrocuted to death. | | | |
| **Assessment** | **Without mitigation** | | **With mitigation** | |
| **Nature** | Negative | | Negative | |
| **Duration** | On-going | Impact will last between 15 and 20 years | On-going | Impact will last between 15 and 20 years |
| **Extent** | Local | Extending across the site and to nearby settlements | Limited | Limited to the site and its immediate surroundings |
| **Intensity** | Moderate | Natural and/ or social functions and/ or processes are moderately altered | Low | Natural and/ or social functions and/ or processes are somewhat altered |
| **Probability** | Almost certain / Highly probable | It is most likely that the impact will occur | Likely | The impact may occur |
| **Confidence** | High | Substantive supportive data exists to verify the assessment | High | Substantive supportive data exists to verify the assessment |
| **Reversibility** | Medium | The affected environment will only recover from the impact with significant intervention | High | The affected environmental will be able to recover from the impact |
| **Resource irreplaceability** | Low | The resource is not damaged irreparably or is not scarce | Low | The resource is not damaged irreparably or is not scarce |
| **Significance** | **Moderate - negative** | | **Minor - negative** | |
| **Comment on significance** | Habitat loss and disturbance will persist for the lifetime of the facility. The habitat could be partly restored thereafter. | | | |
| **Cumulative impacts** | Cumulative impacts on fauna are predicted to be low because there are no fauna species of high conservation concern are likely to be compromised by the development and habitat loss in general would be low. | | | |

### *6.1.4 Operational Phase Impact 2. Impacts on Critical Biodiversity Areas*

Some parts of the development footprint are located within areas that are classified as CBAs and Ecological Support Areas. Many of the areas classified as CBAs have been lost to transformation since the CBA map was developed, while some of the areas classified as CBA are historically transformed or degraded with the result that the development would not significantly impact biodiversity pattern of process in these areas. In addition, many of these areas are threatened by poor management and there are various mitigation options available to improve the habitat quality in these areas through alien clearing and similar actions. As a result, the impact of the development on CBAs is likely to be low after mitigation.

| **Project phase** | **Operation** | | | |
|---|---|---|---|---|
| **Impact** | **Impacts on Critical Biodiversity Areas** | | | |
| **Description of impact** | Operational phase impact on Critical Biodiversity Areas and ESAs. | | | |
| **Mitigatability** | High | Mitigation exists and will considerably reduce the significance of impacts | | |
| **Potential mitigation** | - Minimise the development footprint as far as possible, which includes locating temporary-use areas such as construction camps and lay-down areas in previously disturbed areas.<br>- Avoid impact to restricted and specialised habitats such as pans, wetlands and dune fields (This has been achieved under the current layout).<br>-Alien clearing and continued management in and around those parts of the development footprint which are within natural to near-natural vegetation in order to improve the habitat quality of these areas and limit further degradation of the site from alien invasion. | | | |
| **Assessment** | **Without mitigation** | | **With mitigation** | |
| **Nature** | Negative | | Positive | |
| **Duration** | Permanent | Impact may be permanent, or in excess of 20 years | On-going | Impact will last between 15 and 20 years |
| **Extent** | Local | Extending across the site and to nearby settlements | Local | Extending across the site and to nearby settlements |
| **Intensity** | Moderate | Natural and/ or social functions and/ or processes are moderately altered | Very low | Natural and/ or social functions and/ or processes are slightly altered |
| **Probability** | Certain / definite | There are sound scientific reasons to expect that the impact will definitely occur | Likely | The impact may occur |
| **Confidence** | High | Substantive supportive data exists to verify the assessment | High | Substantive supportive data exists to verify the assessment |
| **Reversibility** | Low | The affected environment will not be able to recover from the impact - permanently modified | Medium | The affected environment will only recover from the impact with significant intervention |
| **Resource irreplaceability** | Medium | The resource is damaged irreparably but is represented elsewhere | Low | The resource is not damaged irreparably or is not scarce |
| **Significance** | **Moderate - negative** | | **Minor - positive** | |
| **Comment on significance** | The natural to near-natural parts of the site are currently under threat from alien vegetation and the improved management of these areas could significantly enhance the future biodiversity value of these areas. | | | |
| **Cumulative impacts** | Cumulative impacts on CBAs are seen as highly undesirable as many areas of CBAs within the broader study area have already been lost to agricultural transformation since the map was made and the overall ecological functioning of the area is being compromised as a result. The contribution of the current development to such transformation is however low and there are opportunities to generate positive outcomes for terrestrial biodiversity at the site through improved management of areas currently under threat from aliens and other land-use related impacts. | | | |

### *6.1.5 Decommissioning Phase Impact 1. Alien plant invasion following decommissioning*

Decommissioning will result in significance disturbance at the site which will encourage alien plant invasion. There are already numerous problem species present and these will quickly establish and dominate disturbed areas. Problem species present at the site include *Acacia cyclops*, *Acacia saligna*, *Acacia mearnsii*, *Hakea sericea* and *Pinus pinaster*. Black Wattle *Acacia mearnsii* and Port Jackson *Acacia saligna* are a particular problem within the Impofu West study area and have invaded several areas of intact vegetation and resulted in degradation across large parts of the site.

| **Project phase** | **Decommissioning** | | | |
|---|---|---|---|---|
| **Impact** | **Increased alien plant invasion** | | | |
| **Description of impact** | Alien plant invasion following decommissioning | | | |
| **Mitigatability** | High | Mitigation exists and will considerably reduce the significance of impacts | | |
| **Potential mitigation** | -There should be an alien management plan implemented as part of the development which makes provision and budget available for alien clearing and management within the development footprint for at least 5 years after decommissioning.<br>- Regular monitoring for alien plants within the disturbed areas for at least two years after decommissioning or until alien invasives are not longer a problem at the site.<br>- Regular alien clearing should be conducted using the best-practice methods for the species concerned. | | | |
| **Assessment** | **Without mitigation** | | **With mitigation** | |
| **Nature** | Negative | | Negative | |
| **Duration** | Long term | Impact will last between 10 and 15 years | Medium term | Impact will last between 5 and 10 years |
| **Extent** | Local | Extending across the site and to nearby settlements | Local | Extending across the site and to nearby settlements |
| **Intensity** | Moderate | Natural and/ or social functions and/ or processes are moderately altered | Low | Natural and/ or social functions and/ or processes are somewhat altered |
| **Probability** | Almost certain / Highly probable | It is most likely that the impact will occur | Probable | The impact has occurred here or elsewhere and could therefore occur |
| **Confidence** | High | Substantive supportive data exists to verify the assessment | High | Substantive supportive data exists to verify the assessment |
| **Reversibility** | Medium | The affected environment will only recover from the impact with significant intervention | Low | The affected environment will not be able to recover from the impact - permanently modified |
| **Resource irreplaceability** | Low | The resource is not damaged irreparably or is not scarce | Low | The resource is not damaged irreparably or is not scarce |
| **Significance** | **Minor - negative** | | **Minor - negative** | |
| **Comment on significance** | With mitigation, this impact can be well avoided and alien invasion reduced to a low level. | | | |
| **Cumulative impacts** | Alien invasion would contribute to habitat degradation in the area. | | | |

### *6.1.6 Decommissioning Phase Impact 2. Faunal impacts due to decommissioning*

Decommissioning will likely require the use of heavy machinery at the site during the removal of the infrastructure of the development. This may impact fauna present within these areas.

| **Project phase** | **Decommissioning** | | | |
|---|---|---|---|---|
| **Impact** | **Faunal impacts due to decommissioning** | | | |
| **Description of impact** | Impact on fauna due to decommissioning | | | |
| **Mitigatability** | High | Mitigation exists and will considerably reduce the significance of impacts | | |
| **Potential mitigation** | - Any potentially dangerous fauna such as snakes or fauna threatened by the decommissioning activities should be removed to a safe location prior to the commencement of decommissioning activities.<br>- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.<br>- All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises.<br>- No excavated holes or trenches should be left open for extended periods as fauna may fall in become trapped.<br>- All above-ground infrastructure should be removed from the site. Below-ground infrastructure such as cabling can be left in place if it does not pose a risk, as removal of such cables may generate additional disturbance and impact, however, this should be in accordance with the facilities' decommissioning and recycling plan. | | | |
| **Assessment** | **Without mitigation** | | **With mitigation** | |
| **Nature** | Negative | | Negative | |
| **Duration** | Short term | impact will last between 1 and 5 years | Short term | impact will last between 1 and 5 years |
| **Extent** | Local | Extending across the site and to nearby settlements | Local | Extending across the site and to nearby settlements |
| **Intensity** | Moderate | Natural and/ or social functions and/ or processes are moderately altered | Low | Natural and/ or social functions and/ or processes are somewhat altered |
| **Probability** | Almost certain / Highly probable | It is most likely that the impact will occur | Probable | The impact has occurred here or elsewhere and could therefore occur |
| **Confidence** | High | Substantive supportive data exists to verify the assessment | High | Substantive supportive data exists to verify the assessment |
| **Reversibility** | High | The affected environmental will be able to recover from the impact | High | The affected environmental will be able to recover from the impact |
| **Resource irreplaceability** | Medium | The resource is damaged irreparably but is represented elsewhere | Low | The resource is not damaged irreparably or is not scarce |
| **Significance** | **Minor - negative** | | **Minor - negative** | |
| **Comment on significance** | Decommissioning will be of short duration and no long-term impacts are likely. | | | |
| **Cumulative impacts** | Decommissioning will contribute towards cumulative impacts in the area, but this would be transient and no long-term impacts from decommissioning are likely to occur. | | | |

## 6.2 CUMULATIVE IMPACTS

Cumulative impacts resulting from the Impofu West Wind Farm are considered in light of the existing baseline in the area (see Section 3.5), the impact of the Impofu West Wind Farm (see Section 6.1), as well as the potential additional impacts of the Impofu Project as a whole (including Impofu East and North Wind Farms), and then the three additional planned wind farms (Oyster Bay, Banna ba Pifhu and Ubuntu) that were identified within a 30 km radius from the Impofu site. As shown in Figure 13Figure 13, the Oyster Bay Wind Farm is also planned to be constructed to the east of the site, with the Bana ba Pifhu project is east of the site and just south of Humansdorp. The Ubuntu Wind Farm is located north east of Jeffreys Bay.

The footprint of the planned Oyster Bay Wind Farm development is largely restricted to the Tsitsikamma Sandstone Fynbos vegetation type. It is however difficult to evaluate the impact of this development as the specialist studies are outdated and do not indicate the extent of the footprint within intact habitat. However, based on observations of this area in the field, it has also been heavily impacted by transformation and while some parts of the development are located within transformed habitat with minimal impact, this development has a reasonably large footprint within intact vegetation and as a such is considered to contribute moderately to cumulative impacts in the area.

The Bana ba Pifhu project is planned for an area that has highly impacted by transformation, with the result that the footprint of this facility would be largely restricted to transformed habitat. Under the preferred layout only 3 turbines are in intact areas. The overall impact on intact habitat from this development is low and restricted to a small loss of Humansdorp Shale Renosterveld which would not be affected by the current Impofu Wind Farms development. The Ubuntu Wind Farm's planned footprint is restricted largely to Humansdorp Shale Renosterveld and Loerie Conglomerate Fynbos which are again not affected by the current Impofu Wind Farms development. Although the various projects tend to impact on different vegetation types as they become further apart, there is still some cumulative impact that occurs at a broader scale, especially with regards to impact on broad-scale ecological processes such as dispersal ability of fauna and flora and the ability of fauna and flora to respond to climatic fluctuations.

The potential contribution of the Impofu Project as a whole to cumulative impact is considered to be relatively low. The total extent of habitat loss from all three Impofu Wind Farms is estimated at less than 20ha of Tsitsikamma Sandstone Fynbos and less than 10ha of Southern Cape Dune Fynbos, much of which is within highly degraded habitat. Given that there is still a relatively large remaining extent of Tsitsikamma Sandstone Fynbos, the habitat loss within this vegetation unit is not considered to be of high significance, especially as this is spread as numerous small footprints across a large area and includes a large proportion of highly degraded areas. The Impofu West project is the only one that results in habitat loss within the Southern Cape Dune Fynbos vegetation type with the result that the whole contribution is associated with the Impofu West Wind Farm and the other two projects do not contribute to impacts within this vegetation type. It is important to consider the spatial arrangement of impact resulting from all three Impofu Projects as there is a risk that important ecological corridors and processes may be disrupted. However, the footprint within intact vegetation is spread across a very wide area and is composed of many small footprint areas. The result of this is that there are no important corridors or other ecological processes that are likely

to be significantly impacted by the Impofu Project. Similarly, the overall impact on species of concern would also be low as the density of such species within the footprint was observed to be low, overall and within each individual project.

While it is clear that cumulative impact in the area is a significant concern, the avoidance that has been implemented by the developer, has been very effective in reducing the impact of the development to an acceptable low significance level, both at the individual project level (Impofu East, West, North) as well as overall from the cumulative aspect of all three projects.

### *6.2.1 Cumulative Impact 1. Cumulative habitat loss and impact on broad-scale ecological processes*

| **Project phase** | **Construction** | | | |
|---|---|---|---|---|
| **Impact** | **Cumulative habitat loss and impact on broad-scale ecological processes** | | | |
| **Description of impact** | Cumulative impact on broad-scale ecological processes | | | |
| **Mitigatability** | High | Mitigation exists and will considerably reduce the significance of impacts | | |
| **Potential mitigation** | - Avoid impact to restricted and specialised habitats such as dunes or wetlands.<br>- Minimise the development footprint within intact areas as far as possible.<br>- Ensure improved management of adjacent intact areas through erosion control and alien plant control.<br>- Contribute towards the Greater Kromme Stewardship Initiative to improve conservation outcomes in the broader area. | | | |
| **Assessment** | **Without mitigation** | | **With mitigation** | |
| **Nature** | Negative | | Negative | |
| **Duration** | Permanent | Impact may be permanent, or in excess of 20 years | Permanent | Impact may be permanent, or in excess of 20 years |
| **Extent** | Municipal area | Impacts felt at a municipal level | Municipal area | Impacts felt at a municipal level |
| **Intensity** | Moderate | Natural and/ or social functions and/ or processes are moderately altered | Low | Natural and/ or social functions and/ or processes are somewhat altered |
| **Probability** | Likely | The impact may occur | Probable | The impact has occurred here or elsewhere and could therefore occur |
| **Confidence** | High | Substantive supportive data exists to verify the assessment | High | Substantive supportive data exists to verify the assessment |
| **Reversibility** | Low | The affected environment will not be able to recover from the impact - permanently modified | Low | The affected environment will not be able to recover from the impact - permanently modified |
| **Resource irreplaceability** | Medium | The resource is damaged irreparably but is represented elsewhere | Low | The resource is not damaged irreparably or is not scarce |
| **Significance** | **Moderate - negative** | | **Minor - negative** | |
| **Comment on significance** | The low contribution of the current development to cumulative impact is facilitated by the existing high levels of transformation in the area and the avoidance of additional impact on intact habitat. | | | |
| **Cumulative impacts** | The contribution of the current development to cumulative impact is low. | | | |

## 6.3 NO-GO ALTERNATIVE

Under the No-Go alternative, the current land use at the Impofu West site would continue and the wind farm development would not go ahead. Under this scenario, current trends in land use would likely continue into the future. This would result in continued transformation of currently intact vegetation to croplands and pasture as well as the continued degradation of many intact remnants

as a result of alien plant invasion and poor fire and grazing management. It is clear that the No-Go alternative involves a negative trajectory of ecological condition in the area, with long-term negative consequences for biodiversity. Although the development of the wind farm certainly does not guarantee that this does not occur and carries some residual impact itself, the development could be used to facilitate positive long-term biodiversity outcomes in the area. This could be achieved through collaboration and support of the Greater Kromme Stewardship Initiative, which is supporting stewardship and private conservation in the area. With the support of the wind farm, this initiative will be more likely to make significant progress regarding improved land management and biodiversity conservation in the area. The No-Go alternative is almost certain to result in long-term negative impacts on biodiversity, given the land-use trends apparent in the area, while the wind farm development presents an opportunity to work with the Greater Kromme Stewardship Initiative on a sustainable basis to identify critical areas that can be targeted for conservation.

# 7. CONCLUSIONS AND RECOMMENDATIONS

The current study is based on several site visits and detailed field assessment, with the result that the impact assessment and sensitivity map presented herein are based on detailed on-site information and as such have a high degree of confidence. Consequently, there is little uncertainty with regards to the results of the current study and the conclusions reached are based on actual information collected at the site over two seasons. This information has been used to inform the current assessed layout and ensure that potential impacts associated with the development have been reduced as far as possible at the planning stage.

The Impofu West WEF site consists largely of Tsitsikamma Sandstone Fynbos with a small extent of Southern Cape Dune Fynbos in the south and even smaller patches of Southern Afrotemperate Forest in kloofs and along drainage systems. The majority of the Tsitsikamma Sandstone Fynbos within the site has been transformed and there are only a few areas of degraded vegetation remaining. In terms of the faunal communities at the site, the transformation of the area for agriculture has significantly affected the abundance and distribution of fauna at the site. The transformed areas which dominate the Impofu West site have low faunal value and diversity and development within these areas would generate low faunal impact. The intact areas are home to a variety of listed species, including the confirmed presence of Cape Clawless Otter *Aonyx capensis* (Near Threatened) and Blue Duiker *Philantomba monticola* (Vulnerable). In terms of reptiles, there are several listed species known from the area, but none of these were observed at the site and it is unlikely that they would be significantly affected by the development and no important reptiles or their habitats would be significantly impacted by the development. Although the diversity of amphibians in the area is high, there are no listed species that are likely to be affected by the development and due to the avoidance of aquatic features by the development footprint, impacts on amphibians and amphibian habitats would be relatively low and no significant impacts on any particular species or habitats would occur.

In terms of the impact of the development on CBAs, there are numerous turbines located within areas classified as CBAs. However, the results of the field assessment indicate that there has been significant land-use change since the CBA map was produced in 2010 and the many of the turbines within these CBAs are in areas that have since been transformed. These areas no longer contain

any biodiversity of significance and due to the transformation that has taken place, and the underlying reasons these areas were classified as CBAs have been lost. Development within the transformed CBA areas would not have a significant impact on CBAs, while those within degraded areas that are CBAs would have a low impact as the diversity of these areas has been significantly impacted and the development would not compromise the functioning of these areas. The overall impact of the development on CBAs, ESAs and broad-scale ecological processes is likely to be low and is mediated by the low overall development footprint within intact habitats and the degraded condition of the affected near-natural areas.

As there are already several already built wind farms in the area, the potential for cumulative impacts in the area is a significant concern associated with the development. The primary driver of habitat loss and cumulative ecological impact in the area has been transformation for agricultural production. Due to these high existing levels of transformation, the area is considered vulnerable to further impact and it is likely that some ecological processes such as dispersal ability of some species has already been compromised. The additional contribution of wind farm development to direct habitat loss has been low to date. The potential contribution of the Impofu West Wind Farm to existing impact is considered to be low and there do not appear to be any fauna or flora present within the Impofu West site that would be particularly impacted or vulnerable to wind farm development given the layout that has been provided for assessment.

In terms of the sensitivity mapping that was conducted, the intact Dune Fynbos in the south of the site is highlighted as an area of particular significance and is considered unsuitable for development. There are no turbines within this area under the assessed layout. The various drainage systems and intact forest patches present at the site are also considered sensitive habitats that should be avoided as much as possible. In terms of the layout assessed, the high sensitivity areas have already been avoided as far as possible, and there are therefore no turbines in areas considered unsuitable for wind farm development. The layout assessed has been developed iteratively in response to the sensitivity map presented here, which has in turn been extensively verified and validated in the field. As such, there is little uncertainty with regards to the sensitivity mapping at the site and this is important in providing confidence with regards to the predicted impacts of the development on the ecological features of the site.

In terms of the specific contribution of the Impofu West Wind Farm to cumulative impact, habitat loss within intact Tsitsikamma Sandstone Fynbos is conservatively estimated at less than 5ha while the extent of habitat loss within Southern Cape Dune Fynbos vegetation type is estimated at less than 5ha. This is considered to be a low impact and results directly from the avoidance that has been implemented in terms of avoiding intact vegetation as far as possible. The overall contribution of the Impofu West Wind Farm to cumulative impacts on ecological patterns and processes is likely to be low. There are no existing intact ecological corridors that would be disrupted by the wind farm infrastructure and there do not appear to be any fauna or flora present within the site that would be disproportionately impacted or vulnerable to the wind farm development given the layout that has been provided for assessment.

There are no negative impacts associated with the development that cannot be mitigated to a low level. This is driven largely by the transformed nature of large tracts of the site as well as the avoidance of sensitive features that has been implemented under the current layout. The final

footprint is well within the specified limits of acceptable loss as specified, overall and within each sensitivity class. Residual impacts associated with the development are considered acceptable, but can be further reduced and positive outcomes for biodiversity in the area could be well achieved through collaboration and coordination of mitigation activities with the Greater Kromme Stewardship Initiative which is active in biodiversity conservation and management in the area. As the impacts associated with the development of the Impofu West WEF are likely to be of low significance after mitigation, there are no fatal flaws or high post-mitigation impacts associated with the development.

**Impofu West WEF Impact Statement**

There are no negative impacts associated with the development of the Impofu West WEF that cannot be mitigated to a low level. The final footprint of the development is well within the limits of acceptable habitat loss that were defined for the site and no thresholds of concern were exceeded. With the application of relatively simple mitigation and avoidance measures, the impact of the Impofu West WEF on the local environment can be reduced to a low and acceptable magnitude. The contribution of the Impofu West WEF development to cumulative habitat loss and impact in the greater Oyster Bay area would be low and is considered acceptable. Overall, there are no specific long-term impacts likely to be associated with the development of the Impofu West WEF that cannot be reduced to a low significance. As such, there are no fatal flaws associated with the development and no terrestrial ecological considerations that should prevent it from proceeding.

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# 9. APPENDICES

## APPENDIX 1. LIST OF PLANTS

List of plant species of conservation concern (SCC) derived for the Impofu West study area, from the SANBI POSA database.

| Family | Genus | Species | Rank | Subspecies | IUCN |
|---|---|---|---|---|---|
| Fabaceae | *Psoralea* | *repens* | | | NT |
| Hypoxidaceae | *Pauridia* | *minuta* | | | NT |
| Iridaceae | *Moraea* | *australis* | | | NT |
| Proteaceae | *Protea* | *coronata* | | | NT |
| Rutaceae | *Agathosma* | *hirta* | | | NT |
| Amaryllidaceae | *Brunsvigia* | *josephinae* | | | VU |
| Brassicaceae | *Heliophila* | *linearis* | var. | *reticulata* | VU |
| Ericaceae | *Erica* | *chloroloma* | | | VU |
| Ericaceae | *Erica* | *glandulosa* | subsp. | *fourcadei* | VU |
| Ericaceae | *Erica* | *glumiflora* | | | VU |
| Ericaceae | *Erica* | *zeyheriana* | | | VU |
| Fabaceae | *Polhillia* | *pallens* | | | VU |
| Geraniaceae | *Pelargonium* | *suburbanum* | subsp. | *suburbanum* | VU |
| Iridaceae | *Bobartia* | *macrocarpa* | | | VU |
| Orchidaceae | *Satyrium* | *princeps* | | | VU |
| Poaceae | *Capeochloa* | *cincta* | subsp. | *sericea* | VU |
| Poaceae | *Pentameris* | *longipes* | | | VU |
| Polygalaceae | *Polygala* | *pottebergensis* | | | VU |
| Rutaceae | *Agathosma* | *stenopetala* | | | VU |
| Scrophulariaceae | *Selago* | *rotundifolia* | | | VU |
| Amaryllidaceae | *Cyrtanthus* | *clavatus* | | | DD |
| Fabaceae | *Lessertia* | *kensitii* | | | DD |
| Amaryllidaceae | *Brunsvigia* | *litoralis* | | | EN |
| Fabaceae | *Argyrolobium* | *crassifolium* | | | EN |
| Myrsinaceae | *Rapanea* | *gilliana* | | | EN |
| Plumbaginaceae | *Limonium* | *depauperatum* | | | EN |
| Proteaceae | *Paranomus* | *reflexus* | | | EN |

# APPENDIX 2. LIST OF MAMMALS

List of Mammals know from the broad area around the Impofu West site, based on the MammalMap Database (http://vmus.adu.org.za). **Species in Bold are those confirmed present at the site.**

| Family | Genus | Species | Common name | Red list category | No. records |
|---|---|---|---|---|---|
| Bovidae | *Oreotragus* | *oreotragus* | Klipspringer | Least Concern | 197 |
| Bovidae | *Pelea* | *capreolus* | Vaal Rhebok | Least Concern | 2 |
| **Bovidae** | ***Philantomba*** | ***monticola*** | **Blue Duiker** | **Vulnerable** | **3** |
| Bovidae | *Raphicerus* | *campestris* | Steenbok | Least Concern | 8 |
| **Bovidae** | ***Raphicerus*** | ***melanotis*** | **Cape Grysbok** | **Least Concern** | **76** |
| **Bovidae** | ***Redunca*** | ***fulvorufula*** | **Mountain Reedbuck** | **Least Concern** | **194** |
| **Bovidae** | ***Sylvicapra*** | ***grimmia*** | **Bush Duiker** | **Least Concern** | **121** |
| **Bovidae** | ***Tragelaphus*** | ***scriptus*** | **Bushbuck** | **Least Concern** | **994** |
| **Canidae** | ***Canis*** | ***mesomelas*** | **Black-backed Jackal** | **Least Concern** | **21** |
| **Canidae** | ***Otocyon*** | ***megalotis*** | **Bat-eared Fox** | **Least Concern** | **5** |
| **Cercopithecidae** | ***Chlorocebus*** | ***pygerythrus*** | **Vervet Monkey** | ***Least Concern*** | **13** |
| **Cercopithecidae** | ***Papio*** | ***ursinus*** | **Chacma Baboon** | **Least Concern** | **319** |
| **Felidae** | ***Caracal*** | ***caracal*** | **Caracal** | **Least Concern** | **9** |
| Felidae | *Felis* | *nigripes* | Black-footed Cat | Least Concern | 4 |
| Felidae | *Felis* | *silvestris* | Wildcat | Least Concern | 4 |
| Felidae | *Panthera* | *pardus* | Leopard | Least Concern | 162 |
| **Herpestidae** | ***Cynictis*** | ***penicillata*** | **Yellow Mongoose** | **Least Concern** | **4** |
| Herpestidae | *Herpestes* | *ichneumon* | Egyptian Mongoose | Least Concern | 1 |
| **Herpestidae** | ***Herpestes*** | ***pulverulentus*** | **Cape Gray Mongoose** | **Least Concern** | **5** |
| Herpestidae | *Suricata* | *suricatta* | Meerkat | Least Concern | 4 |
| Hyaenidae | *Proteles* | *cristata* | Aardwolf | Least Concern | 5 |
| **Hystricidae** | ***Hystrix*** | ***africaeaustralis*** | **Cape Porcupine** | **Least Concern** | **3** |
| **Leporidae** | ***Lepus*** | ***capensis*** | **Cape Hare** | **Least Concern** | **1** |
| Leporidae | *Lepus* | *saxatilis* | Scrub Hare | Least Concern | 6 |
| Macroscelididae | *Macroscelides* | *proboscideus* | Short-eared Elephant Shrew | Least Concern | 1 |
| Muridae | *Acomys* | *subspinosus* | Cape Spiny Mouse | Least Concern | 1 |
| Muridae | *Aethomys* | *namaquensis* | Namaqua Rock Mouse | Least Concern | 55 |
| Muridae | *Gerbilliscus* | *paeba* | Paeba Hairy-footed Gerbil | Least Concern | 12 |
| Muridae | *Mastomys* | *natalensis* | Natal Mastomys | Least Concern | 22 |
| **Muridae** | ***Mus*** | ***minutoides*** | **Southern African Pygmy Mouse** | **Least Concern** | **1** |
| Muridae | *Myomyscus* | *verreauxi* | Verreaux's Mouse | Least Concern | 3 |
| **Muridae** | ***Otomys*** | ***irroratus*** | **Southern African Vlei Rat** | **Least Concern** | **6** |
| Muridae | *Otomys* | *unisulcatus* | Karoo Bush Rat | Least Concern | 12 |
| Muridae | *Parotomys* | *brantsii* | Brants's Whistling Rat | Least Concern | 3 |
| **Muridae** | ***Rhabdomys*** | ***pumilio*** | **Xeric Four-striped Grass Rat** | **Least Concern** | **65** |

| Family | Genus | Species | Common name | Red list category | No. records |
|---|---|---|---|---|---|
| **Mustelidae** | ***Aonyx*** | ***capensis*** | **African Clawless Otter** | **Near Threatened** | **7** |
| **Mustelidae** | ***Ictonyx*** | ***striatus*** | **Striped Polecat** | **Least Concern** | **4** |
| **Mustelidae** | ***Mellivora*** | ***capensis*** | **Honey Badger** | **Least Concern** | **31** |
| Nesomyidae | *Saccostomus* | *campestris* | Southern African Pouched Mouse | Least Concern | 1 |
| Pedetidae | *Pedetes* | *capensis* | South African Spring Hare | Least Concern | 1 |
| Procaviidae | *Procavia* | *capensis* | Cape Rock Hyrax | Least Concern | 4 |
| Soricidae | *Crocidura* | *flavescens* | Greater Red Musk Shrew | Data Deficient | 3 |
| **Suidae** | ***Potamochoerus*** | ***porcus*** | **Bush Pig** | **Least Concern** | **19** |
| Viveridae | *Genetta* | *maculata* | Common Large-spotted Genet | Least Concern | 1 |
| Viverridae | *Genetta* | *genetta* | Common Genet | Least Concern | 1 |
| Viverridae | *Genetta* | *tigrina* | Cape Genet | Least Concern | 1 |

# APPENDIX 3. LIST OF REPTILES

List of Reptiles known from the vicinity of the Impofu West site, based on records from the ReptileMap database. Conservation status is from Bates et al. 2013. **Species in BOLD are those observed at the site in the current study or during previous studies on adjacent sites.**

| Family | Genus | Species | Subspecies | Common name | Red list category | No. records |
|---|---|---|---|---|---|---|
| **Agamidae** | **Agama** | **aculeata** | **aculeata** | **Common Ground Agama** | **Least Concern** | **9** |
| **Agamidae** | **Agama** | **atra** | | **Southern Rock Agama** | **Least Concern** | **40** |
| Chamaeleonidae | Bradypodion | damaranum | | Knysna Dwarf Chameleon | Least Concern | 7 |
| Chamaeleonidae | Bradypodion | sp. (barbatulum) | | Beardless Dwarf Chameleon | Not Evaluated | 5 |
| Chamaeleonidae | Bradypodion | sp. (Baviaans) | | Baviaanskloof Dwarf Chameleon | Not Evaluated | 8 |
| Chamaeleonidae | Bradypodion | sp. (Groendal) | | Groendal Dwarf Chameleon | Not Evaluated | 2 |
| Chamaeleonidae | Bradypodion | sp. (Jagersbos) | | Dwarf Chameleon sp. 2 | Not Evaluated | 10 |
| Chamaeleonidae | Bradypodion | taeniabronchum | | Elandsberg Dwarf Chameleon | Endangered | 12 |
| **Chamaeleonidae** | **Bradypodion** | **ventrale** | | **Eastern Cape Dwarf Chameleon** | **Least Concern** | **4** |
| **Colubridae** | **Crotaphopeltis** | **hotamboeia** | | **Red-lipped Snake** | **Least Concern** | **12** |
| Colubridae | Dasypeltis | scabra | | Rhombic Egg-eater | Least Concern | 6 |
| Colubridae | Dispholidus | typus | typus | Boomslang | Least Concern | 8 |
| Colubridae | Philothamnus | hoplogaster | | South Eastern Green Snake | Least Concern | 2 |
| **Colubridae** | **Philothamnus** | **natalensis** | **occidentalis** | **Western Natal Green Snake** | **Least Concern** | **8** |
| Colubridae | Philothamnus | semivariegatus | | Spotted Bush Snake | Least Concern | 3 |
| **Cordylidae** | **Chamaesaura** | **anguina** | **anguina** | **Cape Grass Lizard** | **Least Concern** | **7** |
| **Cordylidae** | **Cordylus** | **cordylus** | | **Cape Girdled Lizard** | **Least Concern** | **31** |
| Cordylidae | Karusasaurus | polyzonus | | Karoo Girdled Lizard | Least Concern | 4 |
| Cordylidae | Ninurta | coeruleopunctatus | | Blue-spotted Girdled Lizard | Least Concern | 2 |
| Cordylidae | Pseudocordylus | microlepidotus | microlepidotus | Cape Crag Lizard | Least Concern | 24 |
| Elapidae | Aspidelaps | lubricus | lubricus | Coral Shield Cobra | Not Evaluated | 1 |
| **Elapidae** | **Hemachatus** | **haemachatus** | | **Rinkhals** | **Least Concern** | **2** |
| Elapidae | Naja | nivea | | Cape Cobra | Least Concern | 6 |
| Gekkonidae | Afrogecko | porphyreus | | Marbled Leaf-toed Gecko | Least Concern | 18 |
| Gekkonidae | Chondrodactylus | bibronii | | Bibron's Gecko | Least Concern | 5 |
| Gekkonidae | Cryptactites | peringueyi | | Saltmarsh Gecko | Critically Endangered | 30 |
| Gekkonidae | Goggia | essexi | | Essex's Pygmy Gecko | Least Concern | 2 |
| Gekkonidae | Goggia | hewitti | | Hewitt's Pygmy Gecko | Least Concern | 8 |
| **Gekkonidae** | **Hemidactylus** | **mabouia** | | **Common Tropical House Gecko** | **Least Concern** | **2** |
| **Gekkonidae** | **Lygodactylus** | **capensis** | **capensis** | **Common Dwarf Gecko** | **Least Concern** | **1** |
| **Gekkonidae** | **Pachydactylus** | **maculatus** | | **Spotted Gecko** | **Least Concern** | **20** |
| Gerrhosauridae | Tetradactylus | fitzsimonsi | | FitzSimons' Long-tailed Seps | Vulnerable | 2 |
| Lacertidae | Nucras | lalandii | | Delalande's Sandveld Lizard | Least Concern | 3 |
| Lacertidae | Pedioplanis | burchelli | | Burchell's Sand Lizard | Least Concern | 6 |
| Lacertidae | Pedioplanis | lineoocellata | pulchella | Common Sand Lizard | Least Concern | 7 |
| Lacertidae | Pedioplanis | namaquensis | | Namaqua Sand Lizard | Least Concern | 3 |
| Lacertidae | Tropidosaura | gularis | | Cape Mountain Lizard | Least Concern | 4 |
| **Lamprophiidae** | **Boaedon** | **capensis** | | **Brown House Snake** | **Least Concern** | **11** |
| **Lamprophiidae** | **Duberria** | **lutrix** | **lutrix** | **South African Slug-eater** | **Least Concern** | **11** |
| **Lamprophiidae** | **Homoroselaps** | **lacteus** | | **Spotted Harlequin Snake** | **Least Concern** | **6** |

| Family | Genus | Species | Subspecies | Common name | Red list category | No. records |
|---|---|---|---|---|---|---|
| Lamprophiidae | Lamprophis | guttatus | | Spotted House Snake | Least Concern | 2 |
| Lamprophiidae | Lycodonomorphus | inornatus | | Olive House Snake | Least Concern | 7 |
| Lamprophiidae | Lycodonomorphus | rufulus | | Brown Water Snake | Least Concern | 10 |
| Lamprophiidae | Lycophidion | capense | capense | Cape Wolf Snake | Least Concern | 5 |
| Lamprophiidae | Prosymna | sundevallii | | Sundevall's Shovel-snout | Least Concern | 2 |
| **Lamprophiidae** | **Psammophis** | **crucifer** | | **Cross-marked Grass Snake** | **Least Concern** | **4** |
| **Lamprophiidae** | **Psammophis** | **notostictus** | | **Karoo Sand Snake** | **Least Concern** | **4** |
| **Lamprophiidae** | **Psammophylax** | **rhombeatus** | **rhombeatus** | **Spotted Grass Snake** | **Least Concern** | **18** |
| Lamprophiidae | Pseudaspis | cana | | Mole Snake | Least Concern | 1 |
| Leptotyphlopidae | Leptotyphlops | nigricans | | Black Thread Snake | Least Concern | 14 |
| Pelomedusidae | Pelomedusa | galeata | | South African Marsh Terrapin | Not evaluated | 2 |
| Pelomedusidae | Pelomedusa | subrufa | | Central Marsh Terrapin | Least Concern | 1 |
| Scincidae | Acontias | meleagris | | Cape Legless Skink | Least Concern | 4 |
| Scincidae | Acontias | orientalis | | Eastern Legless Skink | Least Concern | 2 |
| Scincidae | Scelotes | anguineus | | Algoa Dwarf Burrowing Skink | Least Concern | 13 |
| **Scincidae** | **Trachylepis** | **capensis** | | **Cape Skink** | **Least Concern** | **13** |
| **Scincidae** | **Trachylepis** | **homalocephala** | | **Red-sided Skink** | **Least Concern** | **13** |
| Scincidae | Trachylepis | sulcata | sulcata | Western Rock Skink | Least Concern | 26 |
| **Scincidae** | **Trachylepis** | **variegata** | | **Variegated Skink** | **Least Concern** | **12** |
| **Testudinidae** | **Chersina** | **angulata** | | **Angulate Tortoise** | **Least Concern** | **12** |
| Testudinidae | Chersobius | boulengeri | | Karoo Padloper | Near Threatened | 1 |
| Testudinidae | Homopus | areolatus | | Parrot-beaked Tortoise | Least Concern | 6 |
| Testudinidae | Psammobates | tentorius | verroxii | Verrox's Tent Tortoise | Not Evaluated | 1 |
| Testudinidae | Stigmochelys | pardalis | | Leopard Tortoise | Least Concern | 32 |
| **Typhlopidae** | **Rhinotyphlops** | **lalandei** | | **Delalande's Beaked Blind Snake** | **Least Concern** | **7** |
| Varanidae | Varanus | albigularis | albigularis | Rock Monitor | Least Concern | 3 |
| Varanidae | Varanus | niloticus | | Water Monitor | Least Concern | 7 |
| **Viperidae** | **Bitis** | **arietans** | **arietans** | **Puff Adder** | **Least Concern** | **14** |
| **Viperidae** | **Causus** | **rhombeatus** | | **Rhombic Night Adder** | **Least Concern** | **6** |

# APPENDIX 4. LIST OF AMPHIBIANS

List of Amphibians known from the vicinity of the Impofu West site, based on records from the FrogMap database. Conservation status is from Minter et al. 2004. **Species in Bold are those confirmed present at the site.**

| Family | Genus | Species | Subspecies | Common name | Red list category | No. records |
|---|---|---|---|---|---|---|
| Brevicepitidae | *Breviceps* | *adspersus* | | Bushveld Rain Frog | Least Concern | 8 |
| Brevicepitidae | *Breviceps* | *fuscus* | | Plain Rain Frog | Least Concern | 6 |
| **Bufonidae** | ***Sclerophrys*** | ***capensis*** | | **Raucous Toad** | **Least Concern** | **36** |
| Bufonidae | *Sclerophrys* | *pardalis* | | Leopard Toad | Least Concern | 12 |
| Bufonidae | *Vandijkophrynus* | *angusticeps* | | Sand Toad | Least Concern | 2 |
| Bufonidae | *Vandijkophrynus* | *gariepensis* | *gariepensis* | Karoo Toad (subsp. gariepensis) | Least Concern | 10 |
| Heleophrynidae | *Heleophryne* | *hewitti* | | Hewitt's Ghost Frog | Critically Endangered | 6 |
| Heleophrynidae | *Heleophryne* | *regis* | | Southern Ghost Frog | Least Concern | 4 |
| Hyperoliidae | *Hyperolius* | *horstockii* | | Arum Lily Frog | Least Concern | 1 |
| Hyperoliidae | *Hyperolius* | *marmoratus* | | Painted Reed Frog | Least Concern | 54 |
| Hyperoliidae | *Hyperolius* | *semidiscus* | | Yellowstriped Reed Frog | Least Concern | 1 |
| Hyperoliidae | *Kassina* | *senegalensis* | | Bubbling Kassina | Least Concern | 1 |
| Hyperoliidae | *Semnodactylus* | *wealii* | | Rattling Frog | Least Concern | 5 |
| **Pipidae** | ***Xenopus*** | ***laevis*** | | **Common Platanna** | **Least Concern** | **14** |
| Pyxicephalidae | *Amietia* | *delalandii* | | Delalande's River Frog | Least Concern | 41 |
| **Pyxicephalidae** | ***Amietia*** | ***fuscigula*** | | **Cape River Frog** | **Least Concern** | **45** |
| **Pyxicephalidae** | ***Cacosternum*** | ***boettgeri*** | | **Common Caco** | **Least Concern** | **41** |
| Pyxicephalidae | *Cacosternum* | *nanum* | | Bronze Caco | Least Concern | 70 |
| Pyxicephalidae | *Strongylopus* | *fasciatus* | | Striped Stream Frog | Least Concern | 22 |
| Pyxicephalidae | *Strongylopus* | *grayii* | | Clicking Stream Frog | Least Concern | 77 |
| Pyxicephalidae | *Tomopterna* | *delalandii* | | Cape Sand Frog | Least Concern | 15 |
| Pyxicephalidae | *Tomopterna* | *tandyi* | | Tandy's Sand Frog | Least Concern | 6 |