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Impofu West Wind Farm and Associated Infrastructure, Oyster Bay in the Eastern Cape

15 April 2019
Revision: 0
Reference: 500571

Draft Environmental Impact Assessment Report

Red Cap Impofu West (Pty) Ltd

DEA Ref: 14/12/16/3/3/2/1103

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Project details

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Approval			
Verifier signature		Approver signature	
Name	Kirsten Jones	Name	Andries van der Merwe
Title	Senior Consultant, Environment and Planning	Title	Principal, Environment and Planning

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General site information as required by DEA

<table>
<tr><th>Information Requested by DEA</th><th colspan="3">Description / Details</th></tr>
<tr><td rowspan="9">Descriptions of all affected farm portions; and

21- Digit SG code of all affected farm portions</td><td>Farm Number</td><td>Farm Name</td><td>LPI code</td></tr>
<tr><td>1/717</td><td>Lange Fontein</td><td>C03400000000071700001</td></tr>
<tr><td>818</td><td></td><td>C03400000000081800000</td></tr>
<tr><td>1/676</td><td>Klip Rug</td><td>C03400000000067600001</td></tr>
<tr><td>2/676</td><td>Klip Rug</td><td>C03400000000067600002</td></tr>
<tr><td>3/676</td><td>Klip Rug</td><td>C03400000000067600003</td></tr>
<tr><td>RE/675</td><td>Vergaaderings Kraal</td><td>C03400000000067500000</td></tr>
<tr><td>RE2/678</td><td></td><td>C03400000000067800002</td></tr>
<tr><td>RE/678</td><td></td><td>C03400000000067800000</td></tr>
<tr><td>Copies of deeds of all affected farm portions</td><td colspan="3">Copies of deeds for all farm portions will be included in Annexure B in the final EIR submitted to DEA.</td></tr>
<tr><td rowspan="6">Co-ordinates of corner points for the site</td><td colspan="3">Also refer to Figure 5.1</td></tr>
<tr><td colspan="2">34°3’44.723” S 24°31’59.118” E</td><td>34°4’29.260” S 24°33’4.189” E</td></tr>
<tr><td colspan="2">34°4’14.488” S 24°34’12.862” E</td><td>34°3’37.748” S 24°35’2.723” E</td></tr>
<tr><td colspan="2">34°4’4.710” S 24°35’ 50.402” E</td><td>34°6’19.938” S 24°34’21.559” E</td></tr>
<tr><td colspan="2">34°6’6.361” S 24°33’19.560” E</td><td>34°7’29.626” S 24°31’29.109” E</td></tr>
<tr><td colspan="2">34°7’41.374” S 24°30’31.508” E</td><td>34°5’8.355” S 24°31’25.400” E</td></tr>
<tr><td>Photos of areas that give a visual perspective of all parts of the site</td><td colspan="3">Figures showing view across northern part of the site:
  </td></tr>
</table>

	 Figure showing southern edge of the site (primarily No-Go area):  Please refer to Section 6 for more photographs of the site.
Photographs from sensitive visual receptors (tourism routes, tourism facilities, etc.)	The Visual Impact Assessment (Appendix E10) shows photomontages from key viewpoints with high visibility.
Facility design specifications including:	
Type of technology	Wind Energy – onshore turbines.
Number of turbines	Up to a maximum of 29 wind turbine generators.
Structure height	Hub height from 90 m to 120 m, rotor diameter up to 150 m (75 m blade / radius) therefore the maximum tip height will reach up to 195 m. A minimum ground clearance (i.e. lower tip height) of 30 m has been applied.
Surface area to be covered (including associated infrastructure such as roads)	Total approximately 455,750 m^2 comprising of: Temporary construction laydown areas (turbine hardstand areas): 29 x 100 x 50 m = 145,000 m^2; Temporary site camp areas: 15,000 m^2 and batching plant area of approximately 1,000 m^2; Permanent upgrade of existing tracks and roads and construction of new roads covering an area of approximately 240,000 m^2; Permanent laydown areas of approximately 29 x 50 x 30 m = 43,500 m^2; and Impofu West Substation approximately 150 x 75 m = 11,250 m^2. Temporary areas will be rehabilitated after construction.

Structure orientation	The turbine blades will not be fixed and will be able to rotate in order to catch the prevailing winds.
Laydown area dimensions (construction period and thereafter)	See above - taken into account in the overall surface area.
Generation capacity	3 - 6 MW per turbine, depending on selected technology.
Generation of the facility as a whole at delivery points	Up to 174 MW (up to 6 MW per turbine x 29 turbines).

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NEMA requirements for Environmental Impact Assessment Report		
Appendix 3	**Content as required by NEMA**	**Section**
3 (1)(a)	(i) details of the EAP who prepared the report; and	Section 2.3 and Appendix A
	(ii) details of the expertise of the EAP, including a curriculum vitae;	
(b)	the location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including:	Section 1.2 and Section 5.2
	(i) the 21 digit Surveyor General code of each cadastral land parcel;	
	(ii) where available, the physical address and farm name;	
	(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	N/A
(c)	a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is-	Section 5
	(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or	
	(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	
(d)	a description of the scope of the proposed activity, including-	Sections 1 and 5
	(i) all listed and specified activities triggered and being applied for; and	Section 3.2
	(ii) a description of the associated structures and infrastructure related to the development'	Section 5
(e)	a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	Section 3
(f)	a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Section 5.10
(g)	a motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Section 4.2 and Section 8
(h)	a full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including:	Section 4.2 Section 5.9
	(i) details of the development footprint alternatives considered;	
	(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Section 4.4 and Appendix C
	(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	
	(iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 6
	(v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;	
	(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;	Section 4.3
	(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 6
	(viii) the possible mitigation measures that could be applied and level of residual risk;	
	(ix) if no alternative development footprints for the activity were investigated, motivation for not considering such; and	Section 4.2
	(x) a concluding statement indicating the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report;	Section 8
(i)	a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including -	Section 4 Section 6
	(i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and	

	(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	
(j)	an assessment of each identified potentially significant impact and risk, including -	Section 6 and Section 7
	(i) cumulative impacts;	
	(ii) the nature, significance and consequences of the impact and risk;	
	(iii) the extent and duration of the impact and risk;	
	(iv) the probability of the impact and risk occurring;	
	(v) the degree to which the impact and risk can be reversed;	
	(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and	
	(vii) the degree to which the impact and risk can be mitigated;	
(k)	where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	Section 6 Section 7 Section 8.3
(l)	an environmental impact statement which contains -	Section 8
	(i) a summary of the key findings of the environmental impact assessment;	Section 8.3 Section 8.7
	(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and	Section 6 and Appendix D
	(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	Section 8.3 Section 8.4
(m)	based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	Section 8.7 Appendix F
(n)	the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	Section 8.1
(o)	any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Section 8.3
(p)	a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section 4.5 and Appendix E (all specialist reports)
(q)	a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Section 8.6 Section 8.7
(r)	where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalized;	N/A
(s)	an undertaking under oath or affirmation by the EAP in relation to-	Appendix A
	(i) the correctness of the information provided in the reports;	
	(ii) the inclusion of comments and inputs from stakeholders and I&APs;	
	(iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and	
	(iv) any information provided by the EAP to I&APs and any responses by the EAP to comments or inputs made by I&APs;	
(t)	where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	Section 5.8.4
(u)	an indication of any deviation from the approved scoping report, including the plan of study, including -	N/A
	(i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and	
	(ii) a motivation for the deviation;	
(v)	any specific information that may be required by the competent authority; and	Appendix B and C
(w)	any other matters required in terms of section 24(4)(a) and (b) of the Act.	N/A
(2)	Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to an environmental impact assessment report the requirements as indicated in such notice will apply.	

Contents

Appendices

Figures

Tables

Abbreviations

AIA	Archaeological Impact Assessment
BA	Basic Assessment
BBBEE	Broad-Based Black Economic Empowerment
BPEO	Best Practical Environmental Option
CAA	Civil Aviation Authority
CARA	Conservation of Agricultural Resources Act (43 of 1983)
CBA	Critical Biodiversity Area
COP	Convention of the Parties
CV	*Curriculum Vitae*
DAFF	Department of Agriculture, Forestry & Fisheries
DBSA	Development Bank of Southern Africa
DEA	Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs and Development Planning
DEAT	Department of Environmental Affairs and Tourism
DEDEAT	Department of Economic Development Environmental Affairs and Tourism
DoE	Department of Energy
DRDAR	Eastern Cape: Department of Rural Development and Agrarian Reform
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water Affairs and Sanitation
EA	Environmental authorisation
EAP	Environmental Assessment Practitioner
ECA	Environmental Conservation Act (73 of 1989)
EAPAN	Environmental Assessment Professionals of Namibia
ECBCP	Eastern Cape Biodiversity Conservation Plan
ECO	Environmental Control Officer
ECPHA	Eastern Cape Provincial Heritage Resource Authority
EIA	Environmental Impact Assessment
EIR	Environmental Impact Assessment Report
EMPr	Environmental Management Programme
EMPs	Environmental Management Plans and Programmes
EMS	Environmental management systems
EN	Endangered
ESA	Early Stone Age
ESIA	Environmental and Socio-economic Impact Assessment
GDP	Gross Domestic Product
GN	Government Notice
GPS	Global Positioning System

GW	Gigawatt
Ha	Hectares
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IAIAsa	International Association for Impact Assessment South Africa
IAP2	International Association for Public Participation
IBBA	Important Bird and Biodiversity Areas
IDP	Integrated Development Plan
IRP	Integrated Resource Plan
kV	Kilovolt
LC	Least Concern
LED	Local Economic Development
LSA	Late Stone Age
MAP	Mean Annual Precipitation
MSA	Middle Stone Age
MW	Megawatt
NDP	National Development Plan
NEMA	National Environmental Management Act (107 of 1998)
NFA	National Forests Act (84 of 1998)
NFEPA	National Freshwater Ecosystem Priority Areas
NHRA	National Heritage Resources Act (25 of 1999)
NMBM	Nelson Mandela Bay Metropolitan Municipality
NRTA	National Road Traffic Act (93 of 1996)
NT	Near Threatened
NWA	National Water Act (36 of 1998)
PE	Port Elizabeth
PES	Present Ecological State
PNCO	Provincial Nature Conservation Ordinance
PPP	Public Participation Process
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
Rpm	Revolutions per minute
S&EIA	Scoping and environmental impact assessment
SACNASP	South African Council for Natural Scientific Professions
SAHRA	South African Heritage Resource Agency
SALA	Subdivision of Agricultural Land Act (70 of 1970)
SANRAL	South African National Roads Agency SOC Ltd
SANS	South African National Standard
SBDM	Sarah Baartman District Municipality
SCC	Species of conservation concern

SDF	Spatial Development Framework
SEEDS	Socio-economic and enterprise development strategy
SES	Sustainable Energy Strategy
SKA	Square Kilometre Array
SMMEs	Small, medium, micro enterprises
TIA	Traffic Impact Assessment
ToR	Terms of Reference
UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNFCCC	United Nations Framework Convention on Climate Change
VAC	Visual absorption capacity
VU	Vulnerable
WHCA	World Heritage Convention Act (49 of 1999)
WMA	Water Management Area
WULA	Water Use Licence Application

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1 Introduction

1.1 Wind energy in South Africa

Due to global concerns such as climate change, and the on-going exploitation of non-renewable resources, there is increasing international pressure on countries to increase their share of renewable energy generation. Renewable energy is recognised internationally as a major contributor in protecting the environment (including biophysical, social and economic), when compared to energy generation that relies on fossil fuels, such as coal fired power stations and the use of oil and gas. Renewable energy projects also provide a wide range of environmental, economic and social benefits that can contribute towards long-term global sustainability.

In South Africa, the national utility company, Eskom, sources up to 86.97% of its electricity needs from fossil-fuels (World Atlas, 2016). Eskom recognises that it "is crucial that the private sector plays a role in addressing the future electricity needs of the country as this would reduce the funding burden on Government, relieve the borrowing requirements of Eskom and introduce generation technologies that Eskom may not consider part of its core function which may play a vital role in the future electricity supply options in the country" (Eskom, 2018).

As a result, the South African Government has developed an Integrated Resource Plan (IRP) (2010) in which a target was set to source 17.8 Gigawatts (GW) of the country's electricity supply from renewable energy sources, over a 20-year period from 2010 to 2030 (IPPPP, 2018). An update to the IRP was drafted by the Department of Energy (DoE) and circulated for a 60-day public comment period in August 2018. The updated draft IRP (2018) indicates that the expected electricity demand for South Africa has decreased and that no new nuclear will be planned up until 2030. Of the new build planned by 2030, 52% (18,746 MW) will come from renewable energy, half of which will be wind energy (9,462 MW).

In support of this strategic target, the Department of Energy (DoE) has to date issued three ministerial determinations for the procurement of 13,225 Megawatt (MW) of renewable energy, *viz.* 3,725 MW by 2016 (1,800 MW of which was allocated for onshore wind technology), 3,200 MW by 2020 (1,470 MW of which will be provided by onshore wind energy) and a further 6,300 MW of renewable energy to be procured by 2025 (3,040 MW of which is allocated to onshore wind power). These renewable energy targets are procured through a competitive tendering process called the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) run by the DoE in conjunction with the National Treasury and the Development Bank of Southern Africa (DBSA) (DoE, 2018a).

The proposed Impofu West Wind Farm introduced below would therefore have global significance as it would contribute to South Africa's national commitment to transition to a low carbon economy. Investments in this technology will not only benefit our generation, but many generations to come.

1.2 Introducing the project

Red Cap Energy (Pty) Ltd is overseeing the proposed development of up to three wind farms and associated infrastructure, on adjacent farms near Oyster Bay in the Eastern Cape. These proposed wind farms are named the Impofu North Wind Farm, the Impofu East Wind Farm and the Impofu West Wind Farm, and are referred to collectively as the Impofu Wind Farms. The consolidated site of the Impofu Wind Farms is bounded by the operational Tsitsikamma Community Wind Farm to the west, the Gibson Bay Wind Farm to the south-west, and the Kouga Wind Farm to the south-east (see Figure 1.1 and Figure 1.2). This area lies on a section of coastal plain with the ocean on either side which results in excellent wind conditions and low levels of turbulence, making it one of the best wind resources in the country and ideal for wind farm development.

Aurecon South Africa (Pty) Ltd was appointed as an independent company, to conduct the Environmental Impact Assessment (EIA) process for the proposed Impofu Wind Farms, and separate Basic Assessment (BA) process for the associated Grid Connection Project. This is to evaluate the potential biophysical and socio-economic impacts associated with the project and to ensure compliance with the relevant environmental legislation.

The Impofu Wind Farms are proposed on a consolidated site of approximately 11,838 hectares (ha), with the Impofu West Wind Farm in the south-western extent of the site. Adjacent and north of that is the proposed Impofu North Wind Farm, with the Impofu East Wind Farm to the east. Each of these Wind Farms will undergo a separate environmental authorisation process. This report provides information relating to the proposed Impofu West Wind Farm.

The proponent, *Red Cap Impofu West (Pty) Ltd*, proposes to develop the Impofu West Wind Farm, which is located entirely within the Kouga Local Municipality, within the Sarah Baartman District Municipality. The Impofu West site is centred on 34°5’28” South latitude and 24°32’53” East longitude, and is approximately 14 kilometres (km) north-west of Oyster Bay as taken from the centre point. The Impofu West Wind Farm footprint is approximately 2,640 hectares (ha) in extent, comprising eight adjoining farm portions, refer to Section 5.1 for further details.

Energy generated by the Impofu West Wind Farm (hereafter referred to as the project) will be evacuated from the site via a proposed 132 kilovolt (kV) overhead powerline, approximately 120 km in length, that would feed into the national electricity grid at the Nelson Mandela Bay Metropolitan Municipality (NMBM) Chatty substation, in Port Elizabeth. The routing of this Grid Connection and the associated impacts are currently being investigated via a separate BA impact assessment.

Additional ancillary infrastructure for the Impofu West Wind Farm would include underground and above-ground cabling between project components, onsite substation/s, foundations to support turbine towers, hardstands to support cranes at each turbine, and permanent operations/maintenance buildings, office and workshop areas. Service and access roads will be constructed in addition to upgrading existing roads, with the relevant stormwater infrastructure and gates constructed as required. Formal laydown areas for the construction period, containing temporary maintenance and storage buildings along with guard cabins, will be established. These have been further explained in Section 5.

Since the project is associated with energy generation, and energy projects are dealt with by the national authority, the competent authority for this project is the National Department of Environmental Affairs (DEA). The DEA has indicated that each of the three proposed Impofu Wind Farms and the Grid Connection must be subject to its own EIA/ BA process and that separate EIA/ BA reports must be submitted to the competent authority for consideration.

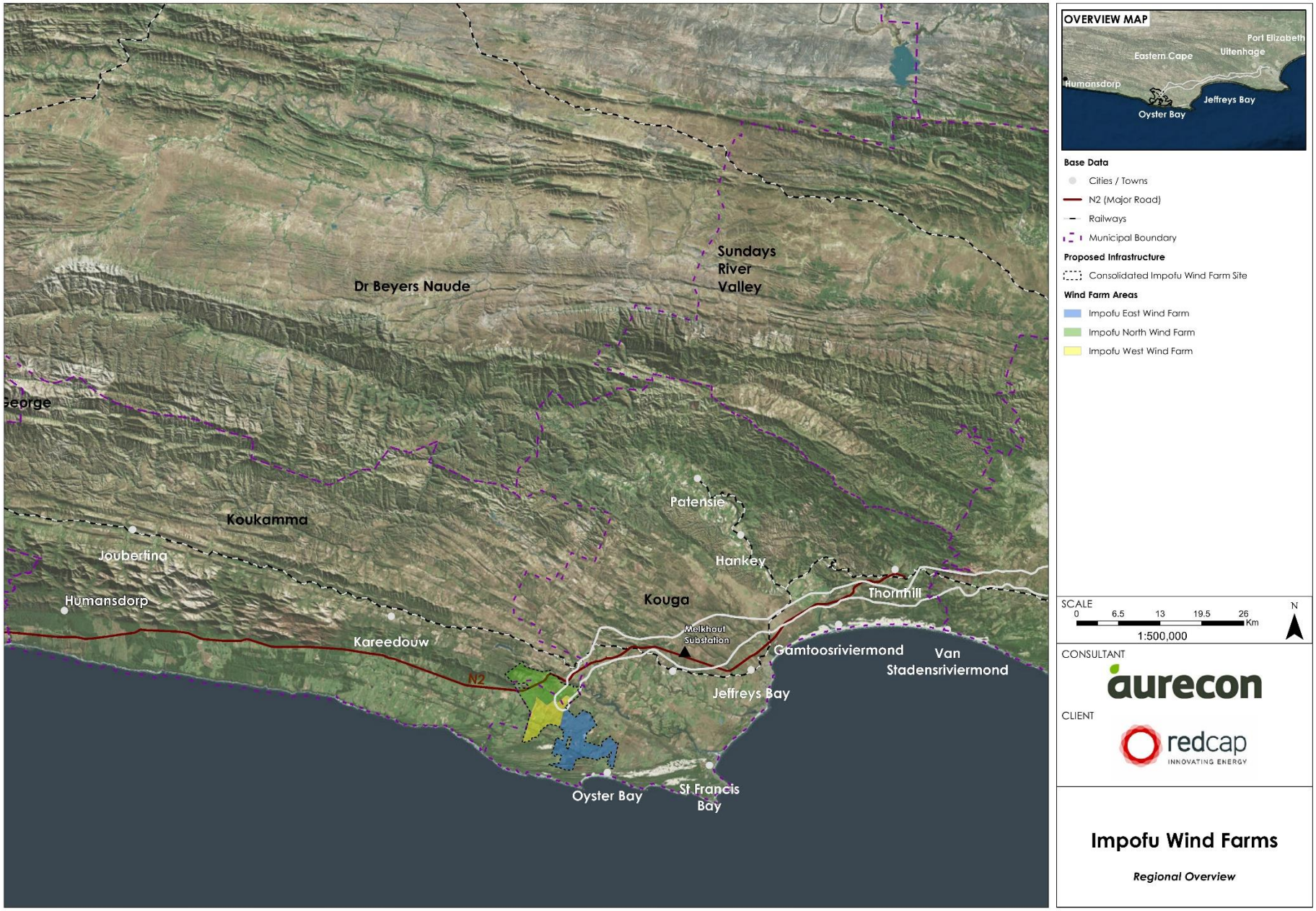


Figure 1.1: Regional locality map

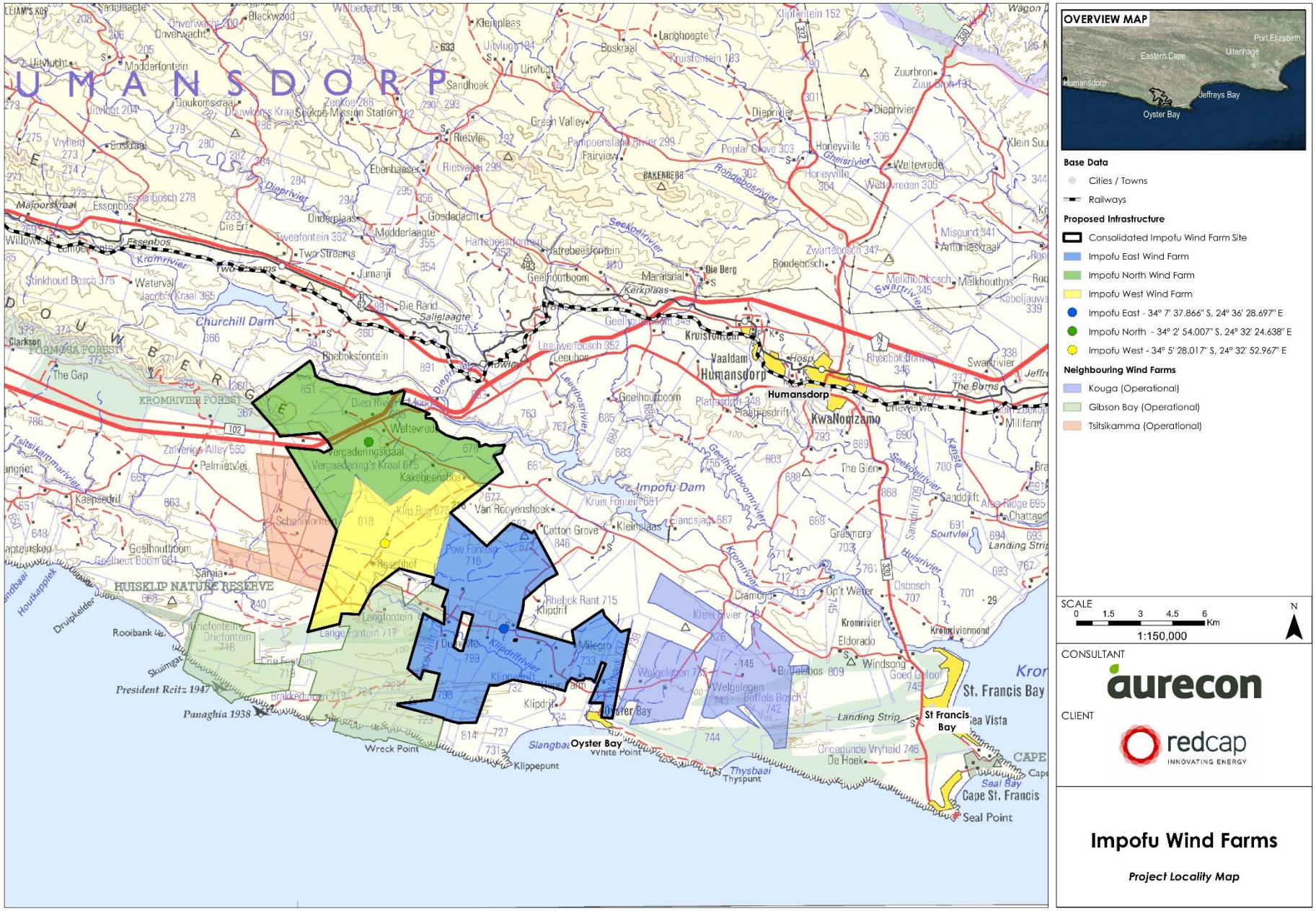


Figure 1.2: Project locality map

1.3 The Scoping and EIA process

The project involves a number of 'listed activities' in terms of Section 24(5) of the National Environmental Management Act (107 of 1998) (NEMA), 'EIA Regulations' published in Government Notice (GN) No. R982, R983, R984 and R985 in the Government Gazette of 8 December 2014, as amended. Accordingly, the proposed project requires environmental authorisation before any activities can commence.

As the project is for the development of a wind farm of more than 20 MW (GN R984), a Scoping and EIA process is required. This project also includes a number of activities listed under GN R983 and R985 which collectively form part of the proposal. All the identified listed activities are set out in Table 3.2 in Section 3. The legislated EIA process entails two phases, a Scoping Phase and an EIA Phase. For this project, there was also an initial Screening Phase, Iterative Design Phase, and a Pre-Application Phase. These phases are discussed in further detail in Section 4. This report serves to document the EIA Phase of the process and is the Draft Environmental Impact Assessment Report (EIR).

1.4 Purpose of the EIR

The purpose of this EIR is to present the project within its current context, describe the process and outcome of how the most suitable location and layout was identified and present the assessment of the impacts and the respective mitigation measures. Accordingly, the EIR includes the following sections:

- **Section 1 – Introduction:** introduces the project in the context of the renewable energy industry in South Africa and provides an indication of the environmental process to be undertaken for the project.
- **Section 2 – Role-players:** introduces the different role-players involved in the environmental authorisation process.
- **Section 3 – Legal and planning context:** provides an outline and analysis of the legal framework and policies relevant to the project.
- **Section 4 – EIA process and approach:** focusses on the project screening in terms of the preferred site layout, it also describes the EIA methodology, detailing the phases of the EIA as well as the PPP, and any assumptions and limitations associated with the project.
- **Section 5 – Project description:** outlines the nature of the proposed activities, specific to the Impofu West Wind Farm, it summarises the alternatives that were screened out during the Scoping Phase and then considers the need for the proposed project.
- **Section 6 – Baseline environment and potential impacts:** provides a description of the current state of the affected environment as well as a description of the potential impacts that could result from the proposed project, drawn from the respective specialist studies undertaken to date (attached in Appendix E). It includes an assessment of the No-Go alternative for each discipline.
- **Section 7 – Cumulative impact assessment:** provides a description of the methodology and anticipated cumulative impacts associated with the proposed project.
- **Section 8 – Conclusion:** summarises the project, the process to date, the potential environmental impacts that have been assessed and provides a statement on the no-go alternative and the cumulative impacts. It provides an indication of the level of confidence in the assessment and the opinion of the EAP, and the way forward.
- **Section 9 – References:** collates the reference material and literature used to inform report.

2 Role-players

2.1 Introduction

There are a number of role-players involved in the environmental application process. The details of each are set out below, based on the definitions and requirements within GN R982 (2014) of NEMA.

2.2 Proponent

The proponent "*means a person intending to submit an application for environmental authorisation and is referred to an applicant once such application for environmental authorisation has been submitted*".

Red Cap Impofu West (Pty) Ltd, hereafter referred to as Red Cap is the proponent and applicant for this proposed project.

2.3 The Environmental Assessment Practitioner

The Environmental Assessment Practitioner (EAP) means "*the individual responsible for the planning, management, coordination or review of environmental impact assessments, strategic environmental assessments, environmental management programmes or any other appropriate environmental instruments introduced through regulations*".

It is the role of the independent Environmental Assessment Practitioner (EAP) to manage and undertake the application for environmental authorisation for the project on behalf of the applicant, as required in terms of NEMA, as amended. Kirsten Jones from Aurecon is the responsible EAP and has relied on inputs from a selected team of highly experienced specialists and multi-disciplinary practitioners to execute the project in a professional and unbiased manner. Neither Aurecon nor any of its sub-consultants are subsidiaries of Red Cap. Furthermore, all these parties do not have any interest in secondary or downstream developments that may arise out of the authorisation of the proposed project.

The contact details of the EAP are provided in Table 2.1, and the expertise of the individuals responsible for the process are presented in Table 2.2.

Table 2.1: Contact details of the EAP

EAP:	Kirsten Jones
Company:	Aurecon South Africa (Pty) Ltd
Postal Address:	PO Box 494, Cape Town 8000 South Africa
Telephone Number:	(021) 526 6991
Fax Number:	(021) 526 9500
Email Address:	Kirsten.Jones@aurecongroup.com

Aurecon's environmental management systems (EMS) policy provides a quality management system which includes a number of tiers with various responsibilities for each job grade level based on experience in the environmental field. This requires environmental practitioners to prepare reports and gain experience whilst being guided by a senior colleague. The principal consultant would therefore act as a project leader, managing the EIA process, reviewing the reports and signing off on the requisite reports. This would include signing the declarations and taking responsibility for the EIA process. Refer to Appendix A for the signed declaration of interest of the EAP as well as the full CVs of the EAPs involved in the EIA process.

Table 2.2: Expertise of the EAPs

EAP	Kirsten Jones	Charles Norman
Role	Technical Lead (EAP)	Technical Reviewer
Qualifications	MSc (Environmental Science)	MPhil (Env Law)
Years of experience	12	30
Environmental management experience	Environmental and socio-economic impact assessment (ESIA), Scoping and environmental impact assessment (S&EIA) reports, Basic assessment reports (BARs), Environmental management plans and programmes (EMPs/EMPrs), Screening studies and constraints analyses / feasibility assessments, and Public participation processes	Screening studies and constraints analyses / feasibility assessments, Scoping and environmental impact assessment (S&EIA) reports, Permitting Processes for Environmental Impact Assessments and Basic Assessment Reports, Environmental and socio-economic impact assessment (ESIA)
Industries of experience	Energy (renewable, gas, and transmission), mining, roads and bridges and urban regeneration projects	Energy (renewable, hydropower and transmission), mining, roads, water, infrastructure and manufacturing
Countries of experience	South Africa, Namibia, Mozambique, Nigeria, UK	South Africa, Tanzania, Ethiopia, Malawi, Uganda, Zambia, Mozambique, Rwanda, Burundi, Australia
Memberships	Professional natural scientist with the South African Council for Natural Scientific Professions (SACNASP), International Association for Impact Assessment South Africa (IAIAsa), and International Association for Public Participation (IAP2)	International Association for Impact Assessment South Africa (IAIAsa)

2.4 Specialists

A specialist means "*means a person that is generally recognised within the scientific community as having the capability of undertaking, in conformance with generally recognised scientific principles, specialist studies or preparing specialist reports, including due diligence studies and socio-economic studies*".

Several specialist disciplines have been identified as relevant to the nature of the proposed development and the receiving environment. Specialists have been appointed directly by the proponent to undertake the necessary studies specific to their discipline and their inputs have been a key informant to the iterative design process undertaken to date. The specialist CVs, or summaries thereof, are included in their respective reports, in Appendix E, and their details are set out in Table 2.3 below.

Table 2.3: Details of the specialists

Specialist field	Consultant	Company
Terrestrial ecology	Simon Todd	3Foxes Biodiversity Solutions (Pty) Ltd
Aquatic ecology	Dr Brian Colloty	Scherman, Colloty & Associates
Bats	Werner Marais	Animalia consultants

Specialist field	Consultant	Company
Avifauna	Jon Smallie	Wildskies ecological services
Agriculture	Johann Lanz	Independent consultant
Socio-economic	Matthew Keeley and Thomas Parsons	Urban-Econ Development Economists
Palaeontology*	Dr John Almond	Natura Viva
Archaeology	Dr Peter Nilssen	Independent consultant
Noise and shadow flicker	Astrid Peeters and Lien Van Breusegem	3E
Visual	Quinton Lawson and Bernard Oberholzer	Quinton Lawson, Architect and Bernard Oberholzer, Landscape Architect
Traffic	Athol Schwarz	Independent consultant

*This specialist contributed at the Scoping Phase of the process and this field was scoped out of the EIA Phase. Although the impacts have not been assessed in detail, the report is attached as Appendix E7 as the impacts and mitigation are still relevant.

The EIA Regulations set out the content requirements for Specialist's Reports (Appendix 6 of GN R982). These have been applied to the assessment reports undertaken to date.

2.5 Interested and Affected Parties

Interested and Affected Party (I&AP), "*for the purposes of Chapter 5 of the NEMA and in relation to the assessment of the environmental impact of a listed activity or related activity, means an interested and affected party contemplated in Section 24(4)(a)(v), and which includes-*

- *any person, group of persons or organisation interested in or affected by such operation or activity; and*
- *any organ of state that may have jurisdiction over any aspect of the operation or activity."*

Details of the principles and processes for stakeholder engagement are set out in Section 4.4 and Appendix C, which includes a database of all I&APs involved in the Scoping and EIA process thus far.

2.6 Competent authority

A competent authority, "*in respect of a listed activity or specified activity, means the organ of state charged by this Act with evaluating the environmental impact of that activity and, where appropriate, with granting or refusing an environmental authorisation in respect of that activity*".

In this case, the competent authority is the Department of Environmental Affairs (DEA) and their details are set out in Table 2.4 below, whilst their duties are described further in Section 4.

Table 2.4: Competent authority details

Name:	Department of Environmental Affairs (DEA): Integrated Environmental Authorisations	
Contact:	Thabile Sangweni (Case officer)	Muhammad Essop
Postal Address:	Private Bag X447, Pretoria, 0001	
Physical Address:	473 Steve Biko Road, Arcadia Pretoria, 0001	
Telephone Number:	012 399 9409	012 399 9406
Fax Number:	012 359 3625	
Email Address:	TSangweni@environment.gov.za	MEssop@environment.gov.za

3 Legal and planning context

The proposed Impofu West Wind Farm and associated activities are governed by various pieces of legislation and a number of policy documents as detailed in the section below.

3.1 Relevant legislation

An overview of the legislation that governs development is provided in Table 3.1 based on the relevancy to the project.

Table 3.1: Relevant legislation

Legislation	Relevant organ of state / authority	Relevance
Aviation Act (74 of 1962)	Civil Aviation Authority (CAA)	Wind turbine generators may potentially interfere with radio navigation equipment. Turbines are also considered to be potential physical obstacles and may need to be a certain colour (white) or fitted with aviation warning lights as required by the CAA. Comment on the project will be sought from the CAA as part of the public participation process (see Appendix C), and an application for approval of the final site layout will be submitted to the CAA by the Proponent. This approval will form part of the requirements for the bid submission in terms of the REIPPPP.
Conservation of Agricultural Resources Act (43 of 1983) (CARA)	Department of Agriculture, Forestry and Fisheries (DAFF)	The purpose of this Act is to ensure that natural agricultural resources of South Africa are conserved through maintaining the production potential of land, combating and preventing erosion, preventing the weakening or destruction of water sources, protecting vegetation, and combating weeds and invader plants. Most of the provisions are accounted for in more recent legislation such as NEMBA and NEMA and no applications are required in terms of this Act. Measures to mitigate potential impacts on agricultural resources, such as soil erosion, alien invasion and protection of vegetation and water resources, have been addressed by the respective specialists (Terrestrial ecology; Aquatic ecology and Agriculture in Section 6) and are included in the Environmental Management Programme (EMPr).
Subdivision of Agricultural Land Act (70 of 1970) (SALA)	Department of Agriculture, Forestry and Fisheries (DAFF)	The purpose of this Act is to control the subdivision and, in connection therewith, the use of agricultural land. Applications should be made to DAFF allow for the subdivision of agricultural land, as well as other prohibited actions in terms of the Act. An application will thus be made to DAFF to authorise actions in relation to this project. A case study has been undertaken to determine the actual impacts versus the anticipated impacts of operational renewable energy developments on agricultural resources in the Kouga area and documents the project's potential contribution to agricultural productivity. This is summarised in Section 6.7.
Eastern Cape Biodiversity Conservation Plan, 2007 (ECBCP)	Department of Economic Development Environmental Affairs and Tourism (DEDEAT)	The ECBCP has no legal standing as it has not yet been declared a bioregional plan in terms of NEMBA. However, since the ECBCP identifies CBAs and provide guidelines with regards to acceptable land uses, the document is an important guideline when considering the linkages between catchments, important rivers and sensitive estuaries since land transformation can result in fragmented landscapes and loss of ecosystem connectivity. The 2018 Draft Plan has not yet been gazetted.

Legislation	Relevant organ of state / authority	Relevance
Environmental Conservation Act (73 of 1989) (ECA)	DEA	In terms of Section 25 of the ECA, the national Noise Control Regulations (GN R154 in Government Gazette No. 13717 dated 10 January 1992) (NCR) was promulgated. The NCRs were revised under Government Notice Number R55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations. In accordance with the Act, two procedures exist for assessing and controlling noise, respectively: • South African National Standard (SANS) 10328:2008 'Methods for environmental noise impact assessments'. • SANS 10103:2004 'The measurement and rating of environmental noise with respect to annoyance and to speech communication' • Other South African National Standards. The proposed development is likely to increase noise levels during operation as well as possible construction noises. Noise emitted by wind farms include aerodynamic sources due to the passage of air over the wind turbine blades and mechanical sources which are associated with components of the power train within the turbine, such as the gearbox and generator and control equipment for yaw, blade pitch, etc. The study includes a noise specialist study in accordance with the relevant SANS.
National Environmental Management Act (107 of 1998) (NEMA), as amended	DEA	The National Environmental Management Act 107 of 1998 (NEMA) provides the framework for environmental decision-making in the country and specifically the EIA Regulations (GN No. R982 in the Government Gazette of 8 December 2014, as amended) serve as the instrument through which development decisions can be made. Specifically, for those developments which comprise certain 'listed activities' identified in GN R983, R984 and R985, as amended, that are considered to have potentially detrimental impacts on the environment. Several listed activities (detailed in Section 3.2 below) have been triggered by the proposed wind farm in terms of the 2014 EIA Regulations (GN R982, as amended). As these activities are listed in GN R983, GN R 984 and GN R985 (as amended), the application for environmental authorisation must consist of a Scoping and EIR process. The Act also sets out various principles that have been adopted in this Scoping and EIR process, such as the precautionary principle duty of care, and polluter pays principle.
National Environmental Management: Biodiversity Act (10 of 2004) (NEMBA)	DEA	The Act calls for the management of all biodiversity within South Africa. The 2007 Threatened or Protected Species Regulations (GN R150, as amended) provides protection through a permit system as well as through the identification of restricted activities. If required, the relevant permits will be applied for. The Act also provides for duty of care with regards to control of alien species. The potential impacts associated with this, as well as the mitigation measures to address the impacts are assessed in the Terrestrial and Aquatic ecology sections (Section 6).
National Heritage Resources Act (25 of 1999) (NHRA)	South African Heritage Resource Agency (SAHRA)	In terms of the National Heritage Resources Act (25 of 1999) (NHRA), any person who intends to undertake *"any development … which will change the character of a site exceeding 5,000 m^2 in extent", "the construction of a road…powerline, or pipeline…exceeding 300 m in length"* must at the very earliest

Legislation	Relevant organ of state / authority	Relevance
	Eastern Cape Provincial Heritage Resource Authority (ECPHRA)	stages of initiating the development notify the responsible heritage resources authority, namely SAHRA or the relevant provincial heritage agency. The relevant provincial heritage agency (ECPHRA) has indicated that a full Heritage Impact Assessment (HIA) is not required, only a palaeontological and archaeological study is to be submitted for approval. A palaeontological study was undertaken at the Scoping Phase and was scoped out of the impact assessment. Although it was not assessed in any detail, it has been included as the potential impacts and mitigation are still relevant, refer to Section 6.9 and Appendix E7. The archaeological impact assessment is included in Section 6.10 and Appendix E8.
National Road Traffic Act (93 of 1996) (NRTA)	Department Roads and Public Works, Eastern Cape	Certain vehicles and loads cannot be moved on public roads without exceeding the limitations in terms of the dimensions and/or mass as prescribed in the Regulations of the NRTA. Due to the large size of many of the facility's components (e.g. tower and blades), they will need to be transported via "abnormal loads". The site is directly adjacent to the N2 therefore providing easy access from national roads. Some roads have been identified for upgrade to ensure that the heavy vehicles can reach the site. SANRAL and the Eastern Cape Department of Roads and Public Works have been provided with an opportunity to comment during the Scoping Report PPP and have been consulted as part of the Traffic Impact Assessment (Section 6.13 and Appendix E11).
National Water Act (36 of 1998) (NWA)	Department of Water and Sanitation (DWS)	Section 21 of the NWA recognises and defines water uses that require the approval of DWS in the form of a General Authorisation or Water Use Licence (WUL). There are restrictions on the extent and scale of identified activities, determined through a risk assessment, for which General Authorisations apply. The project may constitute the following water uses in terms of Section 21 of the Act: (a) Abstraction of water from boreholes and rivers or dams; (b) Storage of water (dams or reservoirs); (c) Impeding or diverting flows when construction occurs within a watercourse or within 500 m of a wetland; (g) Storage of domestic waste in conservancy tanks; and (i) Alteration of the bed or banks of a watercourse of any activities within 500 m of a wetland. A separate Water Use Licence Application (WULA) will be submitted to DWS. However mitigation to reduce impacts on water resources have been provided in the Aquatic ecology impact assessment (Section 6.4) and also in the EMPr (Appendix F).
The National Energy Act (34 of 2008)	Department of Energy (DoE)	One of the requirements for the REIPPPP is for the Proponent to hold an environmental authorisation for the proposed project. As detailed in Section 4, an application for EA requires a Scoping and EIR process to be undertaken. The REIPPPP is guided by the National Energy Act, one of the purposes of which is to promote sustainable development of renewable energy infrastructure.
World Heritage Convention Act (49 of 1999) (WHCA)	World Heritage Convention	The objectives of this Act are to provide for the cultural and environmental protection and sustainable development of, and related activities within World Heritage Sites and giving effect to the values of the Convention. The proposed site does not include any World Heritage Sites. The Klasies River Cave complex, a National

Legislation	Relevant organ of state / authority	Relevance
		Heritage Site, is however approximately 8 km west of the south-west boundary of the site and has been nominated for World Heritage Site status with the United Nations Educational, Scientific and Cultural Organisation (UNESCO).
National Forests Act (84 of 1998), as amended (NFA)	Department of Agriculture, Forestry and Fisheries (DAFF)	There are 47 protected tree species in terms of the NFA, that may not be cut, destroyed, damaged or removed unless a permit has been granted by the DAFF. A number of NFA species do occur (e.g. Milkwood) and the appropriate permits from DAFF must be obtained prior to disturbing this plants / trees.
Nature and Environmental Conservation Ordinance (19 of 1974)	Department of Economic Development Environmental Affairs and Tourism (DEDEAT)	Any endangered or protected plant species listed in Schedules 3 and 4 of this Act, shall not be picked or removed without the relevant permit. Such species have been identified on site (e.g. orchids) and therefore the necessary permits will be required obtained prior to any disturbance.

3.2 National Environmental Management Act (NEMA)

Several listed activities will be triggered in terms of GN R 983, GN R984 and GNR 985 (as amended) and need to be authorised for the proposed development. Based on the listed activities triggered, the application for environmental authorisation will follow the Scoping and Environmental Impact Report (EIR) process as set out in Regulations 21-24 of GN R982. These activities are listed in Table 3.2 below.

Table 3.2: Listed activities in terms of the NEMA 2014 EIA Regulations

No.	Listed Activity	Description of the project component to which the listed activity relates
GN R983 (as amended), 8 December 2014		
11	The development of facilities or infrastructure for the transmission and distribution of electricity – (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kV;	The site is currently zoned as agricultural land and falls outside the urban area. Underground and overhead medium voltage power lines (33 kV or lower) and a 132 kV substations (including control, operation, workshop, storage buildings / areas) will be required for the project.
12	The development of – (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs – (a) within a watercourse; (c) if no development setback exists, within 32 m of a water course, measured from the edge of a watercourse; -	The proposed site is characterised by drainage lines and watercourses scattered across the site. One or more roads and/or powerlines are likely to cross these watercourses or drainage lines or be within 32 m thereof. Where feasible, the development layout has however made use of as many existing farm tracks as possible and tries to minimise any new impacts on these watercourses and drainage lines.
19	The infilling or depositing of any material of more than 10 m^3 into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 m^3 from a watercourse;	A number of internal roads and access roads are likely to cross watercourses and drainage lines. The infilling or depositing of any material of more than 10 m^3 into a watercourse may be triggered with the construction of internal service roads or underground cables crossing the drainage lines.

No.	Listed Activity	Description of the project component to which the listed activity relates
24	The development of a road – (ii) with a reserve wider than 13.5 m, or where no reserve exists where the road is wider than 8 m;	Permanent roads of approximately 6 m wide will be needed with side drains on one or both sides where necessary. During construction roads of approximately 8 m in width, with a reserve / buffer of approximately 12 m may also be temporarily required.
27	The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for- (i) the undertaking of a linear activity;	Although the footprint of all site infrastructure is located outside the highly sensitive No-Go areas and largely within transformed areas, there is the likelihood for some natural but degraded areas to be impacted. This is less than 20 ha. Also note that much of the infrastructure is linear (roads and cable, or overhead lines) which reduces further the total footprint in this regard.
28	... Commercial, industrial… developments where such land was used for agriculture… on or after 1 April 1998 and where such development: (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 ha;	The proposed site is zoned as agricultural land and will continue to be used for agricultural purposes should the proposed project receive environmental authorisation.
56	The widening of a road by more than 6 m, or lengthening of a road by more than 1 km – (ii) where no reserve exists, where the existing road is wider than 8 metres;	Existing roads would be used as far as practically possible and feasible, but may likely require widening up to 6 m and/or lengthening by more than 1 km, to accommodate the movement of heavy vehicles and cable trenching activities. Access roads of approximately 8 m in width, with a reserve / buffer of approximately 12 m may also be temporarily required during construction.
GN R984, (as amended), 8 December 2014		
1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 MW or more,	The proposed project would have a maximum generation capacity of 174 MW. Note that future DOE REI4P bidding rounds may allow wind farms greater than 140 MW and also DEA approved turbine locations may have to be dropped due to other permitting or technical issues in the process of obtaining a fully permitted wind farm.
GN R985 (as amended), 8 December 2014		
4	The development of a road wider than 4 metres with a reserve less than 13,5 metres. **a. Eastern Cape** i. Outside urban areas: (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve;	Access roads of approximately 8 m in width, with a reserve / buffer of approximately 12 m may also be required during construction. The Impofu West wind farm is located approximately 5 km east of the formally protected Huisklip Nature Reserve.
14	The development of- (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs- (a) within a watercourse;	Access roads of approximately 8 m in width will be developed, with a reserve / buffer of approximately 12 m required during construction. These internal roads will cross two watercourses (wetlands) as identified by the aquatic specialist.

No.	Listed Activity	Description of the project component to which the listed activity relates
	(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; **a. Eastern Cape** i. Outside urban areas: (hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve.	The Impofu West wind farm is located approximately 5 km east of the formally protected Huisklip Nature Reserve.
18	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre. **a. Eastern Cape** i. Outside urban areas: (ii) Areas …within 100 metres from the edge of a watercourse where no such setback line has been determined; (kk) A watercourse;	Existing roads would be used as far as practically possible and feasible, but may likely require widening up to 6 m and/or lengthening by more than 1 km, to accommodate the movement of heavy vehicles and cable trenching activities. Access roads of approximately 8 m in width, with a reserve / buffer of approximately 12 m may also be temporarily required during construction. Some of these roads may be located within 100 m of watercourses (drainage lines) on the site, and some crossings may be required.

3.3 Policy

In South Africa, the national utility company, Eskom, sources up to 86.97% of its electricity needs from fossil-fuels. Against the backdrop of heightened climate change awareness and a growing concern around the reliance and environmental impacts of using fossil fuels, as well as an increasing projected electricity demand in the country, a number of policies were developed that aim at diversifying the electricity generation mix for South Africa. These include the White Paper on the Energy Policy of the Republic of South Africa (1998), the White Paper on Renewable Energy (2003) and the National Climate Change Response Policy White Paper (2011) (see Figure 3.1).

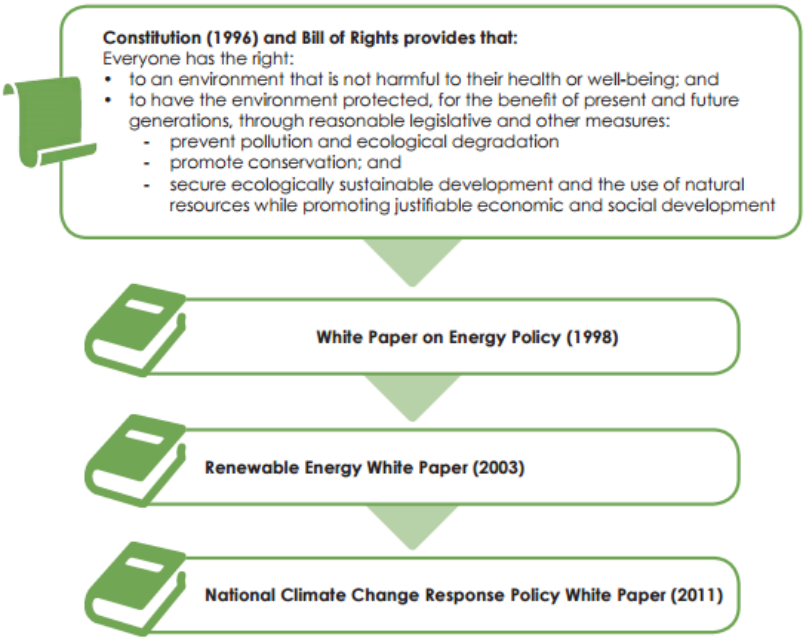


Figure 3.1: Key policies for initiating renewable energy in South Africa (DoE, 2015)

However, despite the proactive policy stance from the early 2000s, by the end of the decade there was an electricity shortage that resulted in rolling black outs in 2008. In direct response to these electricity shortages, the Integrated Resource Plan (IRP) (2010) was issued as a medium-term strategy which set the target for renewable energy supply to 17.8 GW over a 20-year period from 2010 to 2030. An update to the IRP was drafted by the Department of Energy (DoE) and circulated for a 60-day public comment period in August 2018. This draft IRP (2018) indicates that the expected electricity demand for South Africa has decreased and that no new nuclear will be planned up until 2030. Of the new build planned by 2030, 52% (18,746 MW) will come from renewable energy, half of which will be wind energy (9,462 MW). These renewable energy targets are procured through a competitive tendering process called the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP or REIP4) run by the DoE. The success of this programme has been internationally recognised, with the United Nations Environmental Programme (UNEP) 2014 Report placing South Africa among the top-10 countries in respect to renewable energy investment.

In South Africa, renewable energy forms an important part of our energy mix. One of the reasons for this is the substantial foreign equity and financing that has been invested in Renewable Energy Independent Power Producer projects by which amounted to R201.8 billion (R75 billion of which has been wind energy) by June 2018 (DoE, 2018b). Additionally, beyond the foreign investment, localised socio-economic benefits have also been realised through investment in socio-economic development initiatives and enterprise development programmes identified within each project's sphere of influence (R640.3 million socio-economic contribution made to mainly rural communities and R204.6 million contributions to enterprise development and building businesses by June 2018)(DoE, 2018b). In addition, approximately 36,528 direct job years (41,451 Full Time Equivalent jobs)[1] for South African citizens have been created to date, many of which are local to the respective projects. To date (June 2018), a total of 26,840 GWh has been generated by renewable energy, offsetting 27.2 Mton CO_2 emissions and saving 32.2 million kilolitres of water in relation to fossil fuel power generation (DoE, 2018b).

Environmental benefits of wind energy:

The environmental benefits associated with wind energy specifically, are considerable. As an example, 1,000 MW of wind energy (which could be generated by four or five wind farms), if replacing coal, would result in an estimated savings in emissions of 4.3 million CO2e/MWh/annum, which removes 930,000 cars off the road per year (SAWEA, 2018). It would save 2.3 billion litres of water, which is the equivalent of the entire City of Cape Town's consumption over 5 days (SAWEA, 2018). Benefits are even more significant if extrapolated over time, and scaled in terms of generation.

The proposed Impofu West Wind Farm would therefore have both national and global significance as it aligns with national policy direction as well as contributing to South Africa being able to meet some of its international climate change obligations, by aligning domestic policy with internationally agreed strategies and standards as those set by the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol, as well as the recent Convention of the Parties (COP) 21 in Paris 2015, to all of which South Africa is a signatory.

Summary: National policy framework governing renewable energy in South Africa

- White Paper on the Energy Policy of the Republic of South Africa (December 1998)
- Renewable Energy White Paper (2003)
- National Climate Change Response Policy White Paper (2011)
- National Integrated Resource Plan (IRP) (2010)
- Renewable Energy Independent Power Producer Procurement Programme (REIPPPP)

[1] A job year is the equivalent of a full time employment (FTE) opportunity for one person for one year.

3.4 Planning Context

The renewable energy industry has substantial support in the South African planning context, which is detailed in the following national and provincial plans:

- National Development Plan (2012);
- National Integrated Energy Plan (2016)
- National Integrated Resource Plan for Electricity (2010-2013) and updated Draft IRP (2018 and 2019);
- National Infrastructure Plan (2012);
- Eastern Cape Provincial Economic Development Strategy (PEDS) (2017)
- Eastern Cape Sustainable Energy Strategy (SES) (2012); and
- Eastern Cape Climate Change Response Strategy (2011).

More specifically, the proposed Impofu West Wind Farm falls within the jurisdiction of the Kouga Local Municipality and the Sarah Baartman District Municipality. An evaluation of the 'need and desirability' of the project (Section 5.9) considers the strategic context of the project with regards to the municipal Integrated Development Plans (IDPs) and Spatial Development Frameworks (SDFs) as follows:

- Sarah Baartman IDP 2017-2022
- Sarah Baartman SDF 2013
- Kouga IDP 2017-2022
- Kouga SDF 2015

4 EIA process and approach

4.1 Approach

Red Cap have proactively sought to identify the best practical environmental option possible for the identified project site through a rigorous, iterative and multi-disciplinary process, that drew on the considerable body of existing knowledge and specialist expertise relating to the study area. This approach aligns with the NEMA principles advocating for sustainable development through the adoption of the mitigation hierarchy as set out in section 2 of NEMA and depicted in Figure 4.1. Through application of this hierarchy, 'avoidance' of environmental impacts was then the basis for the approach to the process.

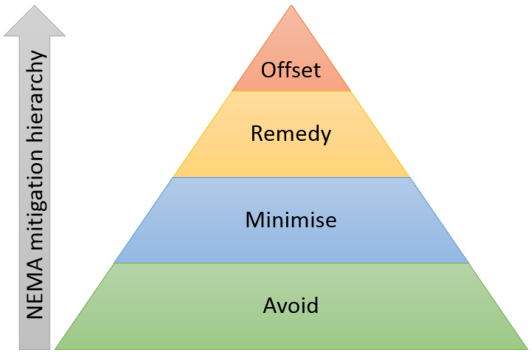


Figure 4.1: Mitigation hierarchy

As the EIA process ascribes stringent timeframes for Scoping and EIA, the approach has been to allow for as much detailed investigation and participation of I&APs upfront as possible, prior to commencement of the legal timeframes when an Application for environmental authorisation is submitted. Therefore, the Pre-Application Phase involved a lengthy and detailed Screening and Iterative Design Process and public participation.

As outlined in Figure 4.2 there are five distinct phases in this EIA process, namely the Screening Phase, Iterative Design Phase, the Pre-Application Phase, the formal Scoping Phase and the EIR Phase (the current phase and basis of this report). The legislated NEMA process and timeframes are depicted in Figure 4.3.

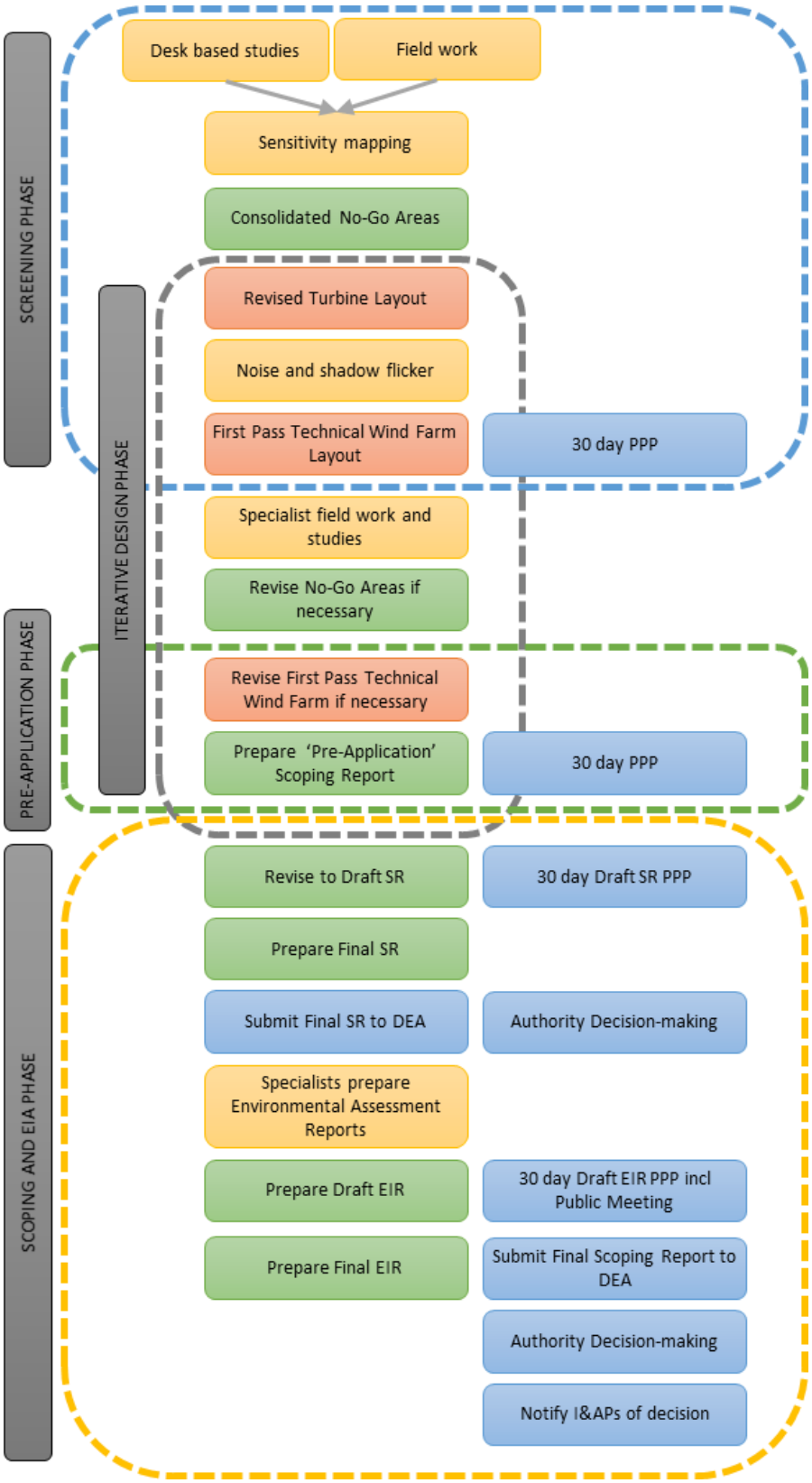


Figure 4.2: Environmental assessment process for the project

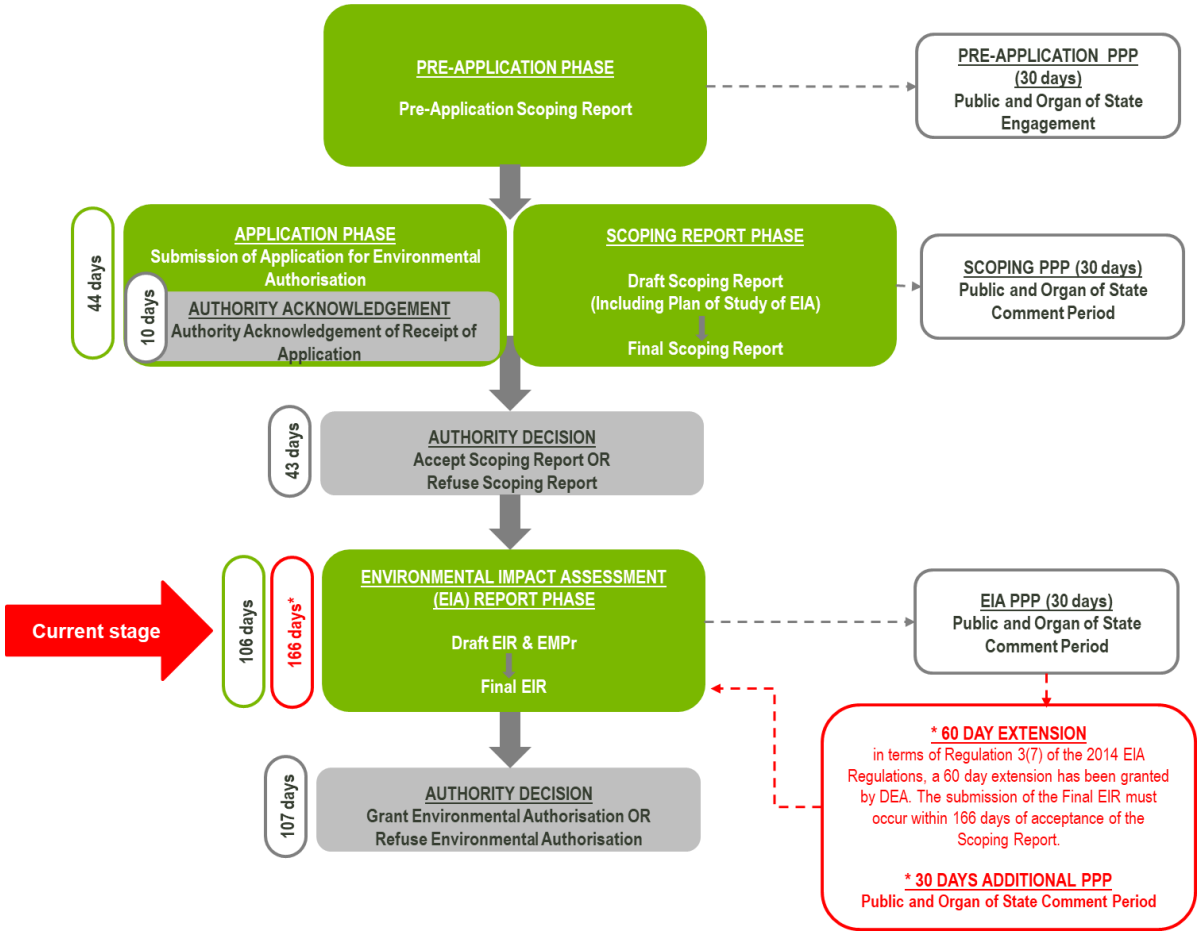


Figure 4.3: Scoping and EIA Process

4.2 Process

4.2.1 Screening and Iterative Design Phase

The Screening and Iterative Design processes were overlapping and are described in detail in the Final Scoping Report (Aurecon, 2018), which motivates[2] why only the No-Go alternative is being assessed in the EIA and how the best practical environmental option was identified. A summary of the process is described below

4.2.1.1 Screening process

To establish the most feasible site and reasonable layout (the 'preferred layout') for the Impofu West Wind Farm, a detailed screening process was undertaken for the consolidated site by Red Cap and a multi-disciplinary team. The screening process in the context of the environmental assessment process is shown in Figure 4.2.

[2] This provides the motivation with regards to Appendix 2 (Contents of Scoping Report) of GN R982 of 2014, as amended, (2)(1)(g)(x), which states that 'if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such *should be provided in the Scoping Report and described in full*'.

Purpose of screening

Screening is undertaken at the pre-feasibility stage to allow environmental and social impacts to be considered early on in the project lifecycle and evaluated in an integrated manner with the engineering design considerations. Designs based on screening input are therefore sensitive to environmental and socio-economic constraints, reducing projects risks as a whole and supporting the application of the mitigation hierarchy (as advocated in the principles of the NEMA, section 2), in the form of avoidance and minimisation of impacts.

Through the application of environmental sensitivities and associated developmental No-Go areas that should be avoided by a developer, the screening assessment allows the environmentally favourable alternative to be identified, in the form of an environmentally preferred site layout.

The screening process was led by Aurecon, relying on inputs from a multi-disciplinary team, including the various environmental specialists, as well as Red Cap, as the developer, and their appointed engineers regarding the technical requirements for the proposed wind farms. The approach to the screening process was as follows:

1. Specialists undertook a desk based study including engaging with the project information provided by Red Cap and documenting the environmental baseline of the site.
2. Specialists and EAP undertook a desk based study and high-level review of other adjacent projects identified in the area.
3. Specialists identified No-Go, highly sensitive, moderately sensitive and low sensitivity developable areas, for both the turbine layout, and the other associated infrastructure (internal overhead power lines, roads, underground cables and buildings).
4. A one week multi-disciplinary site visit was held. During this week the site visits and additional field work were undertaken where necessary. In addition, a multi-disciplinary screening workshop was held with all the relevant specialists[3] which involved the following:
    a. Each specialist reported on their desk based findings of the site, which had been groundtruthed in the prior site visit. In the case of the bird fieldwork, pre-construction monitoring had already commenced prior to the workshop and was also considered.
    b. Specialists also reported on the criteria that they used to identify and establish their specialist specific No-Go areas and the highly sensitive, moderately sensitive and low sensitivity developable areas. No-Go criteria are listed in Appendix D.
    c. Planning / existing infrastructure No-Go areas were also considered as originally identified by Red Cap and include planning constraints. These are listed in Appendix D as well.
    d. The synergies and overlaps between the specialists' spatially sensitive areas were identified.
    e. Input was provided by the wind farm engineer to describe the site with regards to wind regime and which parts of the site were most suitable for turbine locations.
5. Following the workshop, specialists provided spatial datasets showing highly sensitive, moderately sensitive and low sensitivity developable areas, for both the turbine layout, and the other associated infrastructure (internal overhead power lines, roads, underground cables and buildings). A set of sensitivity maps was created for each specialist discipline, for each type of infrastructure (note in some cases, the same sensitivity layer was applicable to more than one type of infrastructure).
6. The No-Go dataset for each specialist was then extracted and collated to inform a set of Consolidated No-Go Maps for the four types of infrastructure.

[3] Some of the specialists were not present (socio-economic, palaeontology, noise and shadow flicker) as their inputs were not as crucial at this stage in the process, the visual specialist was also not present however these specialists provided input prior to and during the process.

7. The initial developer's turbine layout (as depicted in Appendix D) provided at the outset of the project was revised by the project engineers based on the Consolidated No-Go Maps and arranged into three potential wind farms. The optimal turbine layout aimed to maximise the energy outputs after taking account of the No-Go layers and therefore took into account wake effect as well as elevation.
8. Noise and shadow flicker modelling and bird and bat monitoring were undertaken to further refine the layout.
9. The significant discovery of a Martial Eagle nest along the banks of the Impofu Dam had implications for the wind farm design due to the developer implementing the avifaunal specialist's recommendation to include a 6 km radial buffer as a No-Go area for turbines. The specialist also recommended that a 1.5 km No-Go buffer area around the nest was applicable for the internal overhead power line lines, roads and underground cables and buildings. The avifauna sensitivity maps were updated on this basis, as was the Consolidated No-Go Maps, which were then submitted to the engineers for further layout refinement.

4.2.1.2 Iterative design process

The following steps detail how the screening process led into the iterative design process with the project engineers:

1. Following the revision of the No-Go mapping to include for the Martial Eagle, the turbine locations were re-modelled and the Impofu East substations and associated collector line was re-located to accommodate this new layout.
2. Once the turbine locations had a level of certainty, desk based comment from specialists was sought and taken into account by making further adjustments to the layout.
3. The roads and underground cables were then designed to avoid the identified Consolidated No-Go areas. Where possible, existing roads were used but due to blade lengths of approximately 75 m, the turning circles need to be adequate, and the roads would also need to be of a certain gradient. From a technical perspective, lengths of cable were considered too as electrical losses are incurred with distance.
4. Thereafter, the turbine locations were pegged and a groundtruthing process involving micro-siting of the turbines was undertaken with specific specialists, namely terrestrial ecology, aquatic ecology and archaeology.
5. At the same time, the terrestrial ecology, aquatic ecology and archaeology specialists groundtruthed any areas of concern in relation to the proposed roads and cables which informed the micro-siting. Existing public roads that required upgrading were also identified and considered by the specialists (e.g. the Brakkeduine District Road for Impofu East and the District Road 1774 river crossings for Impofu West outside the site). At this point it was also identified where short sections of overhead powerlines may be required to avoid No-Go areas for roads and cables e.g. wetlands. This process was undertaken in consultation with the relevant specialists, especially avifaunal. The roads and cables design, and the overhead power line design was then finalised for the purposes of a design freeze for the Pre-Application Specialist Assessments.
6. The buildings No-Go layer was developed to site any permanent buildings and temporary construction yards.

The final Consolidated No-Go Areas for the turbines is shown Figure 6.1 and the other infrastructure types are included in Appendix D.

4.2.1.3 Outputs: No Go Mapping

For the purposes of this assessment, four different No-Go maps have been produced to allow for the different types of infrastructure and their respective impacts, namely turbines, internal overhead lines, roads and cables and buildings (to include temporary construction yards as well). DEA interprets a 'No-Go' area as an area where

no development of any infrastructure is allowed. In collaboration with the specialists, certain exceptions have been allowed for linear infrastructure and included as an annotation in the maps attached as Appendix D. This includes the following:

1. Internal overhead power lines:
    a. A 30 m buffer applied to public roads where the lines run parallel to the road, however lines can cross these roads as long as it is at an angle ideally between 45 and 9 degrees and complies with the relevant roads authorities' requirements and approval.
    b. Internal overhead power lines allowed in Bird No-Go areas only in specific cases agreed by specialist.
    c. Terrestrial Ecology No-Go areas apply specifically to the pylon footings.
    d. An exception to the Terrestrial Ecology, Aquatic and Avifauna No-Go areas being when an existing overhead power line bisects a No-Go area; here these areas can be used for overhead power lines (with any rehabilitation, monitoring conditions proposed by the specialist).
    e. Aquatic No-Go areas apply specifically to the pylon footings.
2. Roads and cables:
    a. The only exception to the Aquatic Ecology, Birds and Terrestrial Ecology No-Go areas being where an existing road / farm track bisects a No-Go area; here these areas can be used for roads and underground cables (with any rehabilitation, monitoring conditions proposed by the specialist).
    b. The only exception to the Agricultural No-Go areas being where an existing road / farm track bisects any No-Go areas; with approval from the landowner.
3. All maps:
    a. In the sensitivity mapping undertaken by the terrestrial ecologist (refer to Figure 6.14), levels of 'low', 'medium', 'high', 'very high' and 'No-Go' were identified. The areas of very high sensitivity are considered to be acceptable for development, albeit limited as the tolerance is very low in these areas. However, the EAP has applied both the No-Go layer and the 'very high' sensitivity layers to the consolidated No-Go maps for precautionary purposes because development in the very high areas should be avoided as far as possible (only 1% loss of the total very high sensitivity areas within the site is considered acceptable). Therefore the mapping may reflect minor infringements of infrastructure within such areas. For Impofu West Wind Farm the extent of areas of 'very high' sensitivity to be impacted is calculated as 0.07 ha (0.1% of the total area within the site).

4.2.1.4 Summary

In summary, the layout for the respective infrastructure components was initially informed by the specialist sensitivity mapping and designed by the engineers iteratively with ongoing and detailed specialist and landowner input throughout the design process which included groundtruthing where necessary. It must be noted that continually throughout this process there was interaction with the landowners and adjustments to the layout to ensure the impact on their farming operations from the proposed layout was negligible or positive where possible, in the case of new or upgraded roads.

Iterations of the site layout

The Screening and Iterative Design process for the turbine locations of all three wind farm turbine locations commenced with 208 turbine locations (refer to Appendix D), which was reduced to 172 locations after the multi-disciplinary screening workshop, and reduced further to 130 locations after the discovery of the Martial Eagle. The number of potential turbine locations was then reduced to 129 locations based on micro-siting and the removal of only one site due to potential archaeological sensitivities (with the intention to avoid unnecessary impacts to areas close to and similar to those identified as sensitive by the Gamtkwa Khoisan Council). Further changes were made in the EIA Phase, refer to Section 4.2.4

This phase also included for the following activities:

- A Pre-Application meeting was held with DEA on 17 October 2017 and the minutes are attached in Appendix B. The information gathered was used in refining the Plan of Study for the EIA process and Terms of Reference (ToR) for the specialist studies; and
- An initial round of public participation as detailed below in Section 4.4 was held (in December 2017 – March 2018) which included adverts and a BID as well as focus group meetings with key I&APs although no public meetings.

The outcome of this phase was a proposed site layout for the project which could be assessed by the team of specialists. Although the layout had not been subject to a PPP with public meetings, the project had conceptually been presented to I&APs for comment during the I&AP registration period and focus group meetings.

4.2.2 Pre-Application Scoping Phase

The proposed site layout that was identified during the Screening and Iterative Design Phases was the basis for the Pre-Application Scoping Report. Although the Pre-Application Scoping Phase is not considered to be within the official legislated process and timeframes, the exercise and reporting was undertaken to align with the requirements of Appendix 2(1) of the 2014 EIA Regulations (GN R982 of 2014, as amended).

The Pre-Application Scoping Report therefore documented the extent of, and approach to, the EIA Phase. It also provided a motivation for environmental aspects that, following a preliminary assessment, could either be scoped out of the EIA process, or would require further assessment in the EIR. This formed part of the Plan of Study for the EIA. It was found that all specialist disciplines would undergo further detailed assessment, except for palaeontology which required no further studies.

The Pre-Application Phase involved the circulation of a Pre-Application Scoping Report for a 5 week public comment period between 1 August 2018 and 7 September 2018. The intention was to facilitate as much engagement with I&APs as possible, so that the layout could be well informed by I&AP's concerns and input before entering the legislated NEMA process. Details of the PPP are included in Section 4.4.

Updates to the Pre-Application Scoping Report were necessary, most notably in relation to the bird and bat studies. This was due to ongoing monitoring and comments received from I&APs during the Pre-Application Phase. High sensitivity areas for bats were continually being updated as the 12 month bat pre-construction monitoring study progressed and additional high sensitivity areas were identified. Information with regard to bird migration routes and blue cranes was also updated.

This updated Report was the basis of the Draft Scoping Report detailed in Section 4.2.3.

4.2.3 Scoping Phase

The Scoping Phase commenced with the submission of the application form and circulation of a Draft Scoping Report for PPP on 11 October 2018, undertaken in terms of the requirements listed in Appendix 2 of the 2014 EIA Regulations, as amended.

The Draft Scoping Report was circulated for a 30-day public comment period between 11 October 2018 and 12 November 2018. Details of the PPP are included in Section 4.4. DEA confirmed acknowledgement of receipt of the application and Draft Scoping Report (12 October 2018), and commented on the Draft Scoping Report (7 November 2018). No significant changes were required in order to address comments from I&APs. Once the report was updated to final, it was submitted to DEA on 23 November 2018. DEA provided acknowledgement of receipt of the report on 26 November 2018 on and the Final Scoping Report, including a proposed Plan of Study for the EIA was accepted by DEA on 25 January 2019. These letters have all been included in Appendix B.

As an outcome of the Scoping Phase, impacts on palaeontology were scoped out of the EIA and a Traffic Impact Assessment (TIA) was requested by DEA to address the impacts of additional vehicles using the road network, especially during the construction phase. Furthermore, Red Cap voluntarily selected to undertake a wake effect study due to the concerns raised by adjacent wind farms during the Scoping process.

4.2.4 EIA Phase

Based on the findings of the Scoping Report, the EIA Phase was undertaken in accordance with the Plan of Study for the EIA which formed Section 10 of the Scoping Report (Aurecon, 2018). This EIA and associated EIR has been undertaken in terms of the 2014 EIA Regulations (as amended), with specific adherence to the list of requirements included in Appendix 3 of the Regulations. Cross-references to where the information is located within this report is included in the table of requirements before the Contents Page.

The aim of the EIA is to, through a consultative process, determine the impact and appropriateness of the proposed project on the receiving environment. This requires ensuring that the development considers the relevant policy and planning context, as well as the social, economic and environmental sensitivities of the area. The refined site layout has been the focus of the assessment. The preliminary assessments (as presented at the Scoping Phase) are elaborated in further detail in this EIR. The EIA process is iterative and allows the studies to respond to any additional inputs or design refinement that has occurred. The most notable change in the site layout that has been undertaken in the EIA Phase is based on additional bat high sensitivity areas (No-Go areas). This is described below and the final turbine layout that was designed to avoid all sensitive No-Go areas is depicted on Figure 6.1.

Layout changes between Scoping and EIA Phases

During the Pre-application Phase, a proactive approach was undertaken to commence with specialist studies, specifically the bird and bat pre-construction monitoring surveys, which are undertaken over a 12-month period. The bat pre-construction monitoring period commenced in November 2017 and ended in October 2018. Therefore, the bat sensitivity layers within the Final Scoping Report were initial findings, based on five months of monitoring.

Based on the final pre-construction bat data, as well as consultation with the South African Bat Assessment Association (SABAA), it was decided to include more stringent bat buffers around potentially sensitive areas than those that were used in the Final Scoping Report. The implication of these new sensitivity layers is that the potential developable area has now significantly decreased, and the wind farm layout that had already been assessed by the specialist during the Scoping Phase has had to be redesigned.

As the new layout needed to be developed in a more restricted area (given the larger bat buffers), the turbines must be placed closer together and the potential operational impact of one turbine on the other has now become a significant constraint. Therefore, detailed input was required from wind engineers as well as from wind turbine manufacturers themselves to ensure the new layout was technically feasible. At the same time this new layout had to be discussed with the landowners to ensure it did not unduly impact on their farming or other activities. After an iterative process including the engineers, wind turbine manufacturers and landowners a layout could then be finalised that was technically feasible, avoided all the No Go's and which did not unduly impact the landowners. Only once this was done could the engineers start to design the new road layout to link up all the turbines, whilst avoiding the No-Go areas, and lastly to finalise this with input from the landowners.

The total number of turbines was thus reduced from the initial 208 at the start of the project to the 129 at scoping to the final 95 turbines to be assessed in the EIA stage and the overall site layout was reduced from 15,427 ha to 11,838 ha. Refer to Appendix D for maps.

An application to DEA was made for an extension to the prescribed timeframes by 60 days in terms of Regulation 3(7) of the 2014 EIA Regulations (GN R982 of December 2014, as amended). This was to allow for adequate time to revise the layout with engineers, wind turbine supplier and landowner input and then for the specialist studies, including necessary modelling, and lastly the preparation of the Draft EIR with associated 30-day comment period. The letter was received by DEA on 29 January 2019 and DEA granted the extension on 5 March 2019.

The development of an EMPr was also part of the EIA Phase. An EMPr is a document that collates all information on any proposed management, mitigation, protection or remedial measures that will be undertaken to address the environmental impacts that have been identified in the EIR and describes the proposed impact management actions for all project lifecycle phases. This EIR and EMPr therefore incorporate the inputs of the specialists listed in Table 2.3, with their specialist reports included in Appendix E of this report.

It is a requirement that the Draft EIR is circulated for a 30-day comment period. Comments received during this time are recorded and responded to in a Comments and Response Table within the Public Participation Report in Appendix C, and the EIR will be updated where appropriate. DEA will also have an opportunity to comment on the Draft EIR. The Final EIR will be submitted to DEA no later than 166 days from the acceptance of the Scoping Report.

DEA as the competent authority must then, within 107 days of receipt of the EIR and EMPr, in writing –

(a) grant environmental authorisation in respect of all or part of the activity applied for; or

(b) refuse environmental authorisation.

Thereafter all registered I&APs would be informed of the outcome.

4.3 EIA methodology

4.3.1 Process

The methodology for the EIA Phase has been based on the approved Plan of Study for the EIA process (Section 10 of the Scoping Report) which included the Terms of Reference (ToR) for the specialist studies. The following tasks were undertaken during the EIR Phase:

1. The site layout was revisited due to the findings of the pre-construction bat monitoring data and changes to the bat No-Go areas (detailed in Section 4.2.4);
2. Additional specialist work was undertaken as set out in Table 10.11 of the Final Scoping Report. These findings have been used to inform and refine the impact assessment significance ratings, mitigation measures or recommendations and the cumulative impact assessments where relevant. Over and above any changes to the assessments due to the revision of the layout, the following tasks were also undertaken:
    - Terrestrial ecology – updated baseline based on camera traps and inclusion of a % loss calculation per sensitivity classification to indicate acceptability of the development;
    - Aquatic ecology - inclusion of site walkdown info from March 2018 and updating and finalising PES, and Ecological Importance and Sensitivity scores for respective aquatic systems;
    - Bats – Completion of 12 month monitoring and revision of high sensitivity areas (see above) and quantification of cumulative impacts;
    - Avifauna – updates due to input received during the PPP process and addition of the construction and post-construction monitoring programme;
    - Agriculture – completion of case study of wind farm impacts on production in the area;
    - Socio-economic – interviews with selected I&AP and quantification of impacts where possible;
    - Archaeology - no additional tasks over and above the additional assessment due to the revision of the layout;
    - Noise and shadow flicker – remodelling and calculations of exceedances; and
    - Visual remodelling of viewshed and photomontages.
3. Specialist reports were completed in accordance with Section 4.3.2. The specific tasks applicable to all specialists were detailed in Section 10.10 of the Scoping Report in the Plan of Study to comply with Appendix 6 of the 2014 EIA Regulations (GN R982 of 2014, as amended).
4. Formal and informal interaction continued with a number of key authorities and I&AP's including DAFF, DWS, Eskom, SANRAL and Eastern Cape Department of Roads and Public Works.
5. The EIR has been drafted in accordance with Appendix 3 of the 2014 EIA Regulations (GN R982 of 2014, as amended).
6. The Draft EIR will be circulated for a 30-day public comment period.
7. The EIR will be finalised based on input received during the public comment period, and responses will be circulated to all registered I&APs.
8. The EIR, inclusive of the updated public participation report, will be submitted to the competent authority (DEA) for decision making.
9. Once DEA has made their decision, the registered I&APs will be notified whether an environmental authorisation has been granted or refused for the project.

4.3.2 Impact assessment methodology

This sub-section outlines the proposed method for assessing the significance of the potential environmental impacts. For each predicted impact, criteria are ascribed and these 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), as well as the probability (likelihood). The methodology is quantitative, whereby professional judgement is used to identify a rating for each criteria based on a seven-point scale (refer to Table 4.1); and the significance is auto-generated using a spreadsheet through application of the calculations in the box below. Specialists have the opportunity to comment where they disagree with the auto-calculated impact significance rating.

Calculations

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). These numerical ratings are used in an equation whereby the **consequence** of the impact can be calculated. Consequence 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.

Table 4.1: Assessment criteria for the evaluation of impacts

Criteria	Numerical Rating	Category	Description
Duration	1	Immediate	Impact will self-remedy immediately
	2	Brief	Impact will not last longer than 1 year
	3	Short term	Impact will last between 1 and 5 years
	4	Medium term	Impact will last between 5 and 10 years
	5	Long term	Impact will last between 10 and 15 years
	6	On-going	Impact will last between 15 and 20 years
	7	Permanent	Impact may be permanent, or in excess of 20 years
Extent	1	Very limited	Limited to specific isolated parts of the site
	2	Limited	Limited to the site and its immediate surroundings
	3	Local	Extending across the site and to nearby settlements
	4	Municipal area	Impacts felt at a municipal level
	5	Regional	Impacts felt at a regional level
	6	National	Impacts felt at a national level
	7	International	Impacts felt at an international level

Criteria	Numerical Rating	Category	Description
Intensity	1	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
	2	Very low	Natural and/ or social functions and/ or processes are slightly altered
	3	Low	Natural and/ or social functions and/ or processes are somewhat altered
	4	Moderate	Natural and/ or social functions and/ or processes are moderately altered
	5	High	Natural and/ or social functions and/ or processes are notably altered
	6	Very high	Natural and/ or social functions and/ or processes are majorly altered
	7	Extremely high	Natural and/ or social functions and/ or processes are severely altered
Probability	1	Highly unlikely / None	Expected never to happen
	2	Rare / improbable	Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere
	3	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
	4	Probable	Has occurred here or elsewhere and could therefore occur
	5	Likely	The impact may occur
	6	Almost certain / Highly probable	It is most likely that the impact will occur
	7	Certain / Definite	There are sound scientific reasons to expect that the impact will definitely occur

When assessing impacts, broader considerations are also taken into account. These include the level of confidence in the assessment rating; the reversibility of the impact; and the irreplaceability of the resource as set out in Table 4.2, Table 4.3 and Table 4.4, respectively. The significance rating is shown in Table 4.5.

Table 4.2: Definition of confidence ratings

Category	Description
Low	Judgement is based on intuition
Medium	Determination is based on common sense and general knowledge
High	Substantive supportive data exists to verify the assessment

Table 4.3: Definition of reversibility ratings

Category	Description
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
High	The affected environmental will be able to recover from the impact

Table 4.4: Definition of irreplaceability ratings

Category	Description
Low	The resource is not damaged irreparably or is not scarce
Medium	The resource is damaged irreparably but is represented elsewhere
High	The resource is irreparably damaged and is not represented elsewhere

Table 4.5: Significance ratings

Significance	Negative	Positive
Negligible	Negligible - negative	Negligible - positive
Minor	Minor - negative	Minor - positive
Moderate	Moderate - negative	Moderate - positive
Major	Major - negative	Major - positive

4.4 Public Participation Process (PPP)

4.4.1 Definition of PPP

Section 1 of NEMA defines public participation in the context of environmental authorisation as follows:

> **"Public participation process**" *… means a process by which potential interested and affected parties are given opportunity to comment on, or raise issues relevant to, the application…*

To substantiate, DEA's Public Participation Guidelines (2012:5) introduce public participation as follows:

"*Public participation is one of the most important aspects of the environmental authorisation process… This is because people have a right to be informed about potential decisions that may affect them and that they must be afforded an opportunity to influence those decisions. Effective public participation also facilitates informed decision-making by the competent authority and may result in better decisions as the views of all parties are considered*".

Public participation is an iterative two-way process between the Proponent and the EAP, and the I&APs, whether these be individuals, organisations, or organs of state.

4.4.2 Key stakeholders

The key stakeholders as stipulated by the 2014 EIA Regulations, as amended, include, *inter alia*, the following groups:

- Landowners and adjacent landowners;
- Occupants;
- Relevant district and local municipalities, including ward councillors;
- Relevant national and provincial government departments;
- Relevant national and provincial parastatals and organisations;
- Key stakeholders in renewable energy projects in the area;
- Conservation groups; and
- Other organisations in the area.

4.4.3 Scope of the Public Participation Process

A Public Participation Report has been included in Appendix C and provides detail on the process that has been followed to date, as well as proof of PPP activities. This document will be updated as the project progresses. Table 4.6 summarises the PPP to date and the proposed activities going forward.

Table 4.6: Scope of Public Participation

Task	Date
Screening and Iterative Design Phase	
Pre-Application consultation with DEA	17 October 2017
Multi day Screening site visit by EAP and specialists	10 – 15 September 2017
Identification of initial stakeholders and circulation of background information document (BID) and Screening PPP including: • Written notification • Site notices • Newspaper adverts • Website	December 2017 – Mach 2018
Focus group meetings: • Authorities • Key stakeholders • Landowners	6 – 8 February 2018
Pre-Application Scoping Phase	
5-week PPP on Pre-Application Scoping Report including: • Written notification • Site notice updates • Newspaper adverts • Website • Libraries	1 August – 7 September 2018
Open house/ public meetings • St Francis Bowling Club • Thornhill Hotel • Innibos Lapa	 21 August 2018 22 August 2018 23 August 2018
Pre-Application consultation with DEA	11 September 2018
Scoping Phase	
30-day PPP on Draft Scoping Report including: • Written notification • Website • Libraries	11 October – 9 November 2018
EIA Phase	
30-day PPP on Draft Environmental Impact Report (EIR) including: • Written notification • Site notice updates • Newspaper adverts • Website • Libraries	18 April – 23 May 2019

Task	Date
Public meetings	2 & 3 May 2019

4.4.4 Summary of the issues raised by I&APs

The issues that have been raised by I&APs to date are summarised below in Table 4.7, more details are provided in Appendix C (Public Participation Report) which also describes the manner in which they have been addressed.

Table 4.7: Summary of issues raised by I&APs

Theme	Issues

Avifauna and bats	• Concerns were raised regarding the increase in the cumulative impact of mortality of bird and bat species by the proposed Impofu Wind Farms given the baseline impact already includes the mortalities from the existing wind farms in the area. Specific concern was raised on the robustness of the cumulative assessment on the pre-construction studies for birds and bats;
	• Cumulative impact assessment to consider existing monitoring data;
	• Cumulative impact assessment to consider biodiversity and ecological connectivity;
	• St Francis Bay birding group and individuals concerned about impacts to birds and bats, specifically requesting more information on:
	  • migration paths,
	  • innovative mitigation measures, and
	  • the cumulative impacts associated with existing wind farms - “mega wind farm”; and
	• The Bat and Avifaunal specialist assessments must assess and make recommendations for the preferred hub heights and rotor diameter.

Technical	• An investigation of alternative technologies such as vortex turbines, and constructing offshore wind farms should be considered. • A wake effect study should be undertaken to investigate the wake effect and generation losses associated with neighbouring wind farms, namely the Tsitsikamma Community Wind Farm, and Kouga Wind Farm. This should be the basis of engagement with the technical managers of these wind farms; and • Interference of the associated grid connection with the ability of adjacent wind farms to export generation capacity.
Alternative to nuclear and coal	• General support for wind energy as an alternative to other energy sources such as nuclear.
Socio-economic	• A number of queries centred around job creation from the proposed wind farm; • Queries with regards to construction process, when, will all three wind farms be built simultaneously, and where would construction staff live. What opportunities are there for local SMMEs and how can they be ready; and • How will the beneficiaries of the local spending be chosen.
Services	• Concern was highlighted on the possible impact on the existing road network; • Request to assess impacts on roads and existing infrastructure, given damage to roads caused by previous wind farms, recommendations were also provided; • SANRAL conditions supplied for activities in proximity to national roads; and • Eskom conditions supplied mostly regarding servitude restrictions.
Process	• Positive feedback on the approach undertaken to avoid sensitive areas in layout. • DEDEAT requested an extension of public commenting period based on the date on which the reports where received;

Theme	Issues
	• The Final Scoping Report must provide evidence that all identified and relevant competent authorities have been given an opportunity to comment on the proposed development; particularly the South African Astronomical Observatory, the Eastern Cape Environmental Department, the District and Local Municipalities; • The EAP is to identify and defend any preferred mitigation where specialists have provided contradictory measures; • DEA definition of a 'no-go' area versus specialist definitions should be explicit and buffers should be depicted; and • The Final Scoping Report must indicate and describe the competing land use in the area. This must further motivate the desirability of locating the wind energy facility at the preferred location.
Agriculture	• Concern was raised with regards to biosecurity and the threat of animals moving between farm properties; and • Detailed recommendations provided by DAFF with regards to design, micro-siting, construction methods (topsoil stockpiling, rehabilitation, drainage, traffic management), control of alien invasive plant species and protection of water sources and associated vegetation.
Water use license	• The study area is in close proximity to a number of NFEPA wetlands and rivers/streams therefore in terms of the National Water Act (36 of 1998) a water use authorisation is required for any activity taking place within 500 m radius of a wetland.
Heritage	• No objection from the ECPHRA on condition that the recommendations made in the HIA reports are adhered to and implemented by the developer.

4.5 Assumptions, limitations and gaps in knowledge

In undertaking this investigation and compiling the Scoping Report, the following assumptions and limitations have been identified:

1. The information provided by the Proponent is accurate and unbiased, and no information that could change the outcome of the EIA process has been withheld.
2. The strategic level investigations and feasibility studies undertaken by the client and project engineers prior to the commencement of the EIA process are technically acceptable and robust.
3. This report is based on the most available information to date, both in terms of project description and specialist findings.
4. The information provided by the specialists is accurate and unbiased.
5. Various methods and sources were used to identify the potential social and environmental aspects associated with the proposed project and used to develop the Terms of References (ToRs) for the specialist studies. These include, *inter alia*, the following:
    a. Collection of information specific to the project, as provided by the Proponent, such as project description; construction, operation and decommissioning methodologies, project timeframes and technical information relating to design.
    b. Other relevant BARs/ EIRs prepared for BAs/EIAs undertaken in the area (as referenced in Section 9);
    c. Environmental baseline literature and up to date high resolution aerial imagery derived from aerial survey flown for this project;
    d. Environmental baseline surveys for this site and surrounding areas from site visits undertaken by the respective specialists;

e. Monitoring of environmental aspects such as 12 month bird and bat activity monitoring on the site as well as information from monitoring of bird and bat activities and fatalities on adjacent wind farm sites;
f. Consultation with the project team (including specialists); and
g. Consultation with I&APs, including authorities.

6. The turbine specifications are not confirmed at this stage and hence the total MW of energy to be generated is not yet confirmed. To deal with this limitation, an 'exacerbated rotor swept area envelope' termed a 'worst-case' scenario has been assessed in relation to turbine specifications and this is detailed in Section 5 (Project description). Similarly, a maximum amount of MW is being presented for authorisation.
7. A wake effect study has been undertaken and attached as Appendix E12. Due to the technical nature of the study, and the fact it was not a requirement listed in the Plan of Study, but a voluntary study, the reporting thereof does not follow the standard specialist requirements as set out in Appendix 6 of the 2014 EIA Regulations (GN R982 of 2014, as amended).
8. Any limitations and gaps in knowledge that have been encountered by the specialists are identified in their respective assessments (Appendix E).

5 Project description

5.1 Technical details for proposed facility

Component	Description / Dimensions
Location of the site	The project is located approximately 24 km south-west of Humansdorp, and 14 km north-west of Oyster Bay, in the Sarah Baartman District Municipality in the Eastern Cape as taken from the centre point of the site. The project site area falls within the jurisdiction of the Kouga Local Municipality. The site is bordered immediately to the west by the existing Tsitsikamma Community Wind Farm.
Facility area	The site is ± 2,640 ha in extent.
SG codes	The wind farm site comprises of 8 farm properties. Refer to Table 5.1.
Site access	The site will be accessed from the DR01765, the MN50032, DR01774 and DR01764. Existing roads will be utilised and upgraded as far as possible.
Export capacity	Up to 174 MW (up to 6 MW per turbine x 29 turbines). Note that future DOE REI4P bidding rounds may allow wind farms greater than 140 MW and also DEA approved turbine locations may have to be dropped due to other permitting or technical issues in the process of obtaining a fully permitted wind farm.
Proposed technology	Wind Energy – onshore horizontal access turbines.
Hub height from ground level	Hub height from 90 m to 120 m, rotor diameter up to 150 m (75 m blade / radius) therefore the maximum tip height will reach up to 195 m. A minimum ground clearance (i.e. lower tip height) of 30 m has been applied.[4].
Rotor diameter	Maximum of 150 m
Area occupied by substations *(including operation and maintenance buildings and areas)*	Impofu West substation approximately 150 x 75 = 11,250m^2
Area occupied by both permanent and construction laydown areas	Total approximately 204,500 m^2 comprising of: Temporary construction laydown areas (turbine hardstand areas): 29 x 100 x 50 m = 145,000 m^2; Temporary site camp areas: 15,000 m^2 and batching plant area of approximately 1,000 m^2; Permanent laydown areas of approximately 29 x 50 x 30 m = 43,500 m^2
Area occupied by buildings	See area occupied by substations above.
Width and length of internal roads	Internal road network is ±24 km in length, here existing roads and tracks will be used as far as practicable. Permanent roads will be approximately 6 m wide. Some sections of these roads would need to be temporarily widened up to 12 m during construction.
Length of overhead lines	Approximately 950 m of internal overhead lines (four locations).
Proximity to grid connection	A new Eskom line from Port Elizabeth forms part of a separate application which includes the line, a collector substation, collector line and switching station on the site; this connects directly with the proposed Impofu West substation on the site.
Type and height of fencing	Any existing fences that are disturbed will be repaired or replaced with something similar to the original. Temporary fencing may be erected around the construction site offices and laydown areas, for security, health and safety reasons.

[4] Note that this is considered to represent an exacerbated rotor swept area envelope and the actual turbine used will have a fixed hub height and rotor diameter within these constraints.

Component	Description / Dimensions
	Permanent security fencing will be installed around the substation area to prevent unauthorised access. Fencing may be up to ±3 m in height.

5.2 Site location and description

The Impofu West Wind Farm is proposed as one of three possible Impofu Wind Farms to be developed on a consolidated site amongst adjacent operational wind farms (refer to Section 1.2 and Figure 1.2). The broader area was formerly solely rural in character, but has transitioned to a renewable energy landscape due to the presence of wind turbines and associated infrastructure in the area.

The proposed Impofu West Wind Farm is located approximately 24 km south-west of Humansdorp, and 14 km north-west of Oyster Bay, in the Sarah Baartman District Municipality in the Eastern Cape as taken from the centre point of the site. The project site area falls within the jurisdiction of the Kouga Local Municipality. The site is bordered immediately to the west by the existing Tsitsikamma Community Wind Farm.

The site can be reached directly from the DR01765, the MN50032, DR01774 and DR01764. The Impofu West Wind Farm site comprises 8 adjoining farm portions, as listed in Table 5.1, cumulatively measuring approximately 2,640ha in extent (Figure 5.1).

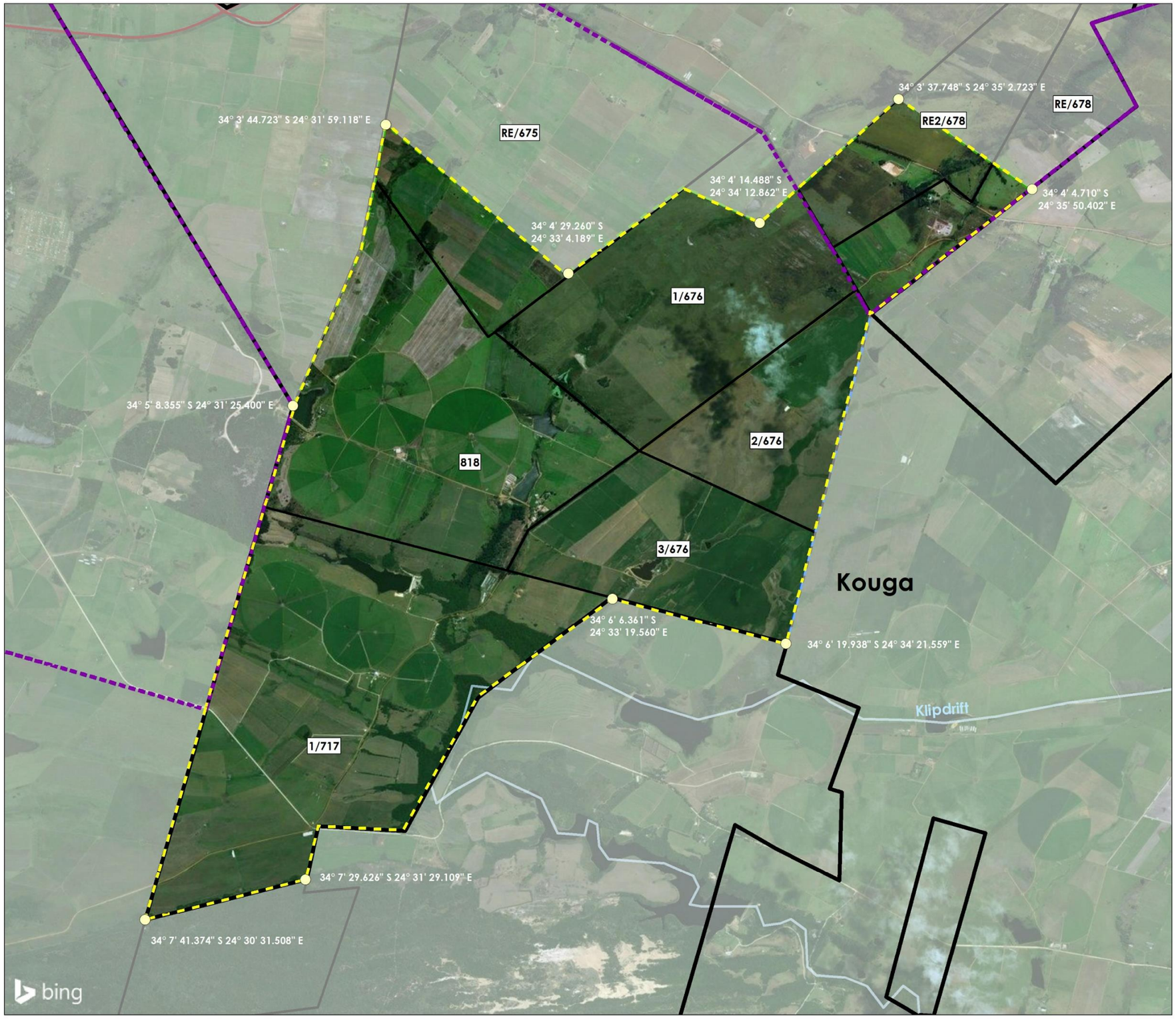
The primary land use of the site is agriculture, namely dairy farming. As such, there are several farm dams and farmsteads on the site, and numerous internal farm and gravel access roads.

Table 5.1: Property details for the proposed project

Name of landowner	Erf number	21-digit SG code	Name of farm
Rosenhof Trust	1/717	C03400000000071700001	Lange Fontein
Kliprug Familie Trust	818	C03400000000081800000	
Steynberg Boedery Trust	1/676	C03400000000067600001	Klip Rug
Johan Andries du Preez	2/676	C03400000000067600002	Klip Rug
Kliprug Familie Trust	3/676	C03400000000067600003	Klip Rug
Basson FT	RE/675	C03400000000067500000	Vergaaderings Kraal
Elmarie Meyer Trust	RE2/678	C03400000000067800002	
Kakebeenbos Boerdery Trust	RE/678	C03400000000067800000	

5.3 Site layout

The proposed site layout for Impofu West Wind Farm depicted in Figure 5.2 was the outcome of the Screening and Integrated Design Process for the Impofu Wind Farms consolidated site as described in Section 4.2 (Process).



Base Data

- Cities / Towns
- Major Roads
- Railways
- Rivers
- Farm Portions
- Municipal Boundary

Proposed Infrastructure

- Consolidated Impofu Wind Farm Site
- Impofu West Wind Farm

Impofu Wind Farm Co-ordinates

- Impofu East Wind Farm
- Impofu North Wind Farm
- Impofu West Wind Farm

SCALE 0 0.4 0.8 1.2 1.6 Km

1:33,000

N

CONSULTANT

aurecon

CLIENT

redcap INNOVATING ENERGY

Impofu Wind Farms

Impofu West Wind Farm:
Project Locality Map

Figure 5.1: Impofu West Wind Farm affected properties

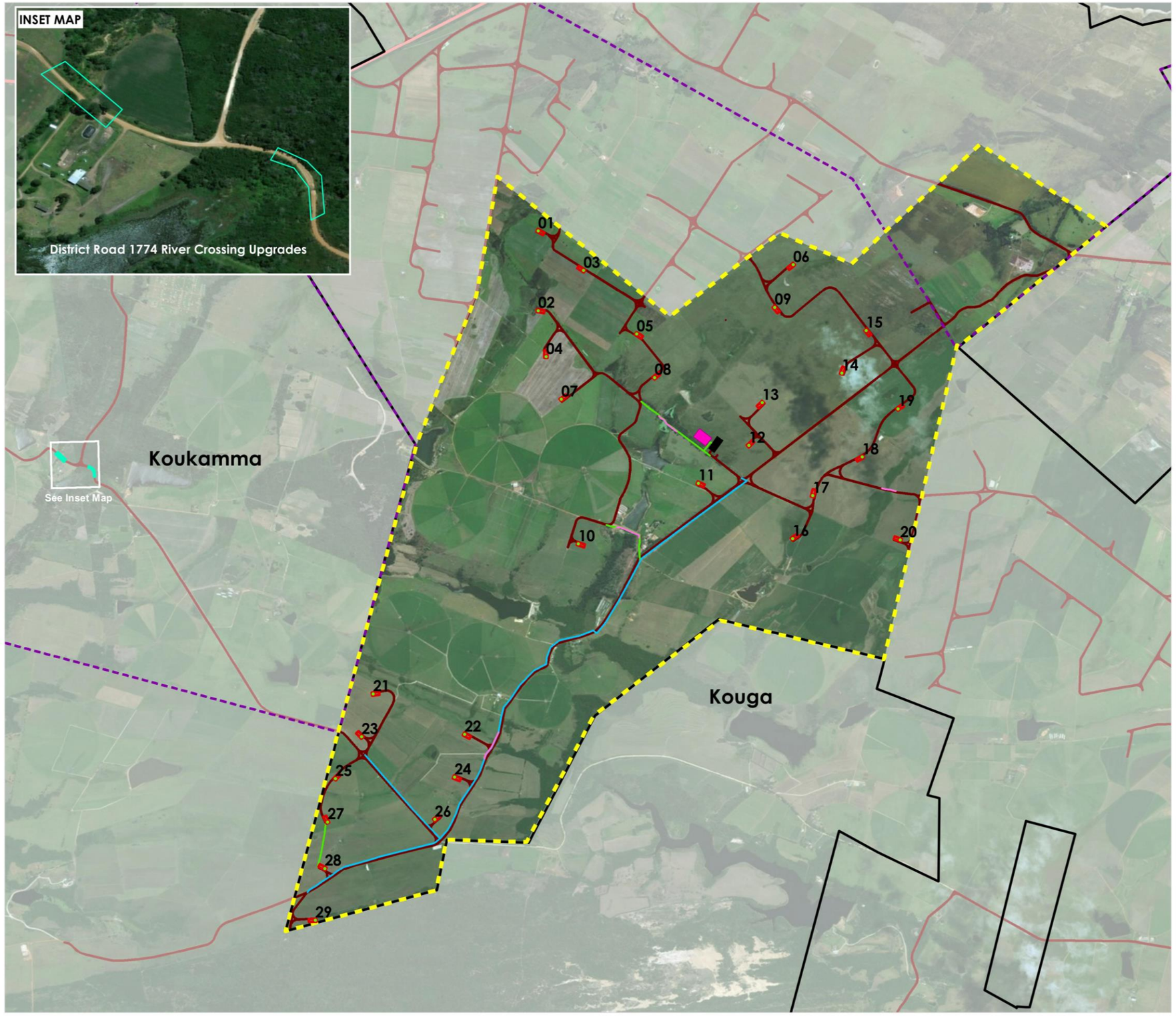


Figure 5.2: Proposed site layout for Impofu West Wind Farm

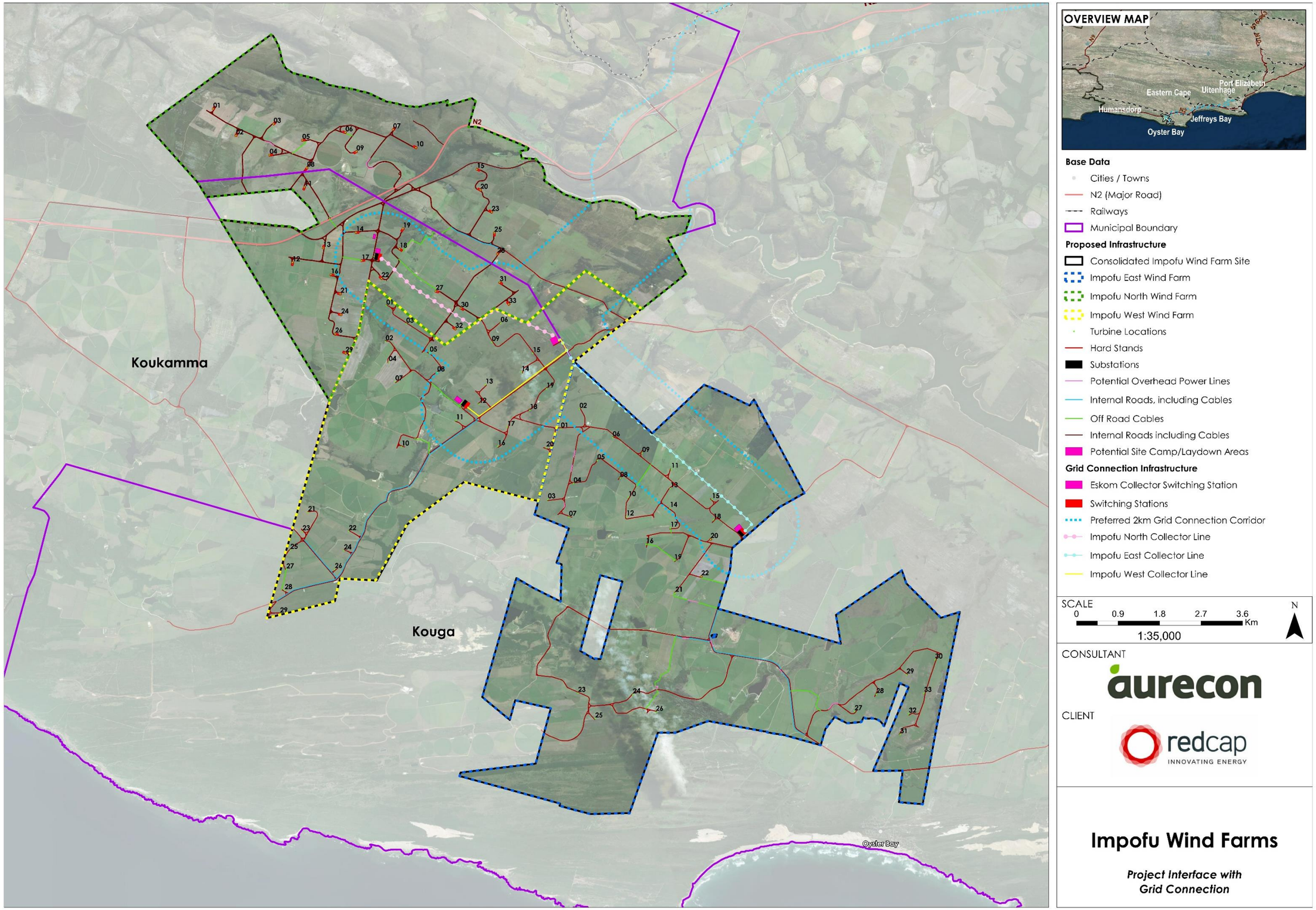


Figure 5.3: Project interface with proposed Grid Connection

5.4 Wind farm components

A wind farm, requires a number of key components to facilitate the generation of electricity at a large scale. As illustrated in Figure 5.4, this includes wind turbines, powerlines and substation facilities to collect the generated electricity and distribute it to other users. The associated connecting infrastructure such as roads, transformers and cabling etc. are designed to ensure project and energy efficiency.

This sub-section describes the components required for the project, with reference to the proposed site layout; as well as providing additional information regarding typical wind turbine technology.

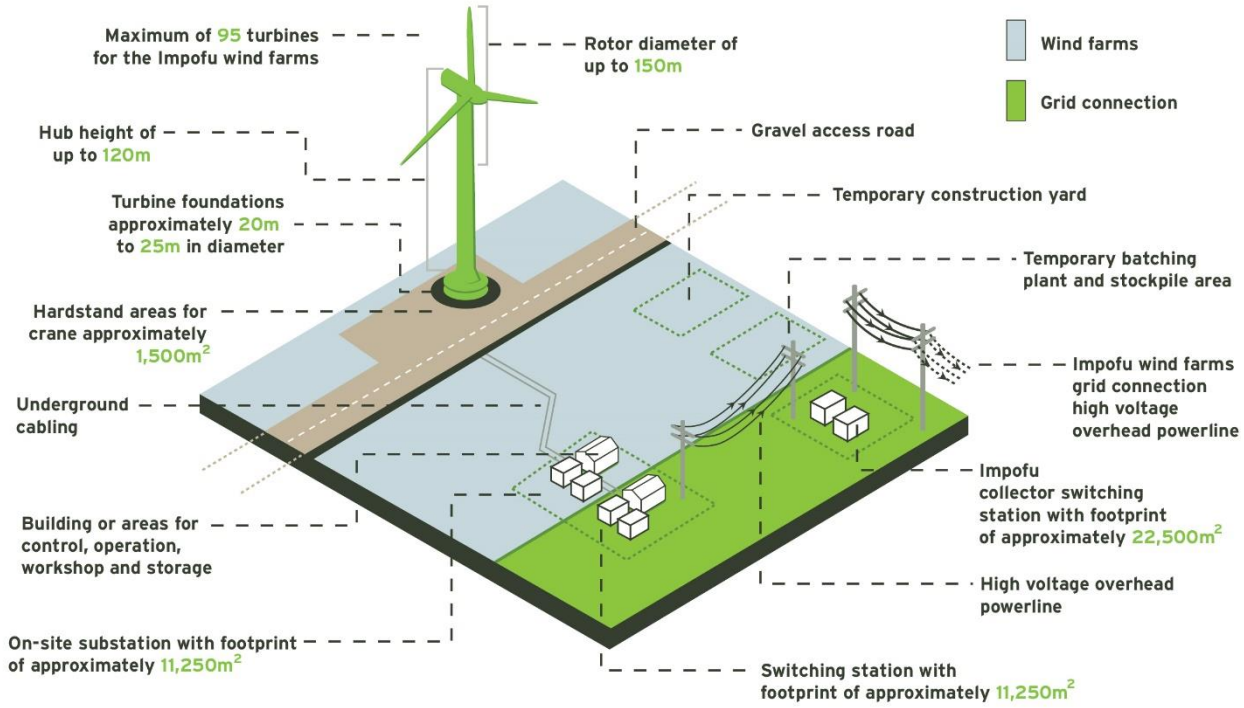


Figure 5.4: Components of the Impofu Wind Farms

5.4.1 Wind turbines

A wind turbine is a rotary device that extracts energy from the wind. The mechanical energy generated is converted to electricity. Wind turbines can rotate about either on a horizontal or vertical axis. Turbines used in wind farms for commercial production of electricity are usually horizontal axis, three-bladed and pointed into the wind by computer-controlled motors, as is proposed for this project. These have high tip speeds of over 320 km/hour, high efficiency, and low torque ripple, which contribute to good reliability. Figure 5.5 and Figure 5.6 provide illustrations of the external and internal components that make up a typical wind turbine.

5.4.1.1 Rotor and blades

The rotor has three blades that typically rotate at 5 – 25 revolutions per minute (rpm) depending on the make and set-up of the turbine, as well as the wind speed on site. The blades are usually coloured white or light grey, and vary in length.

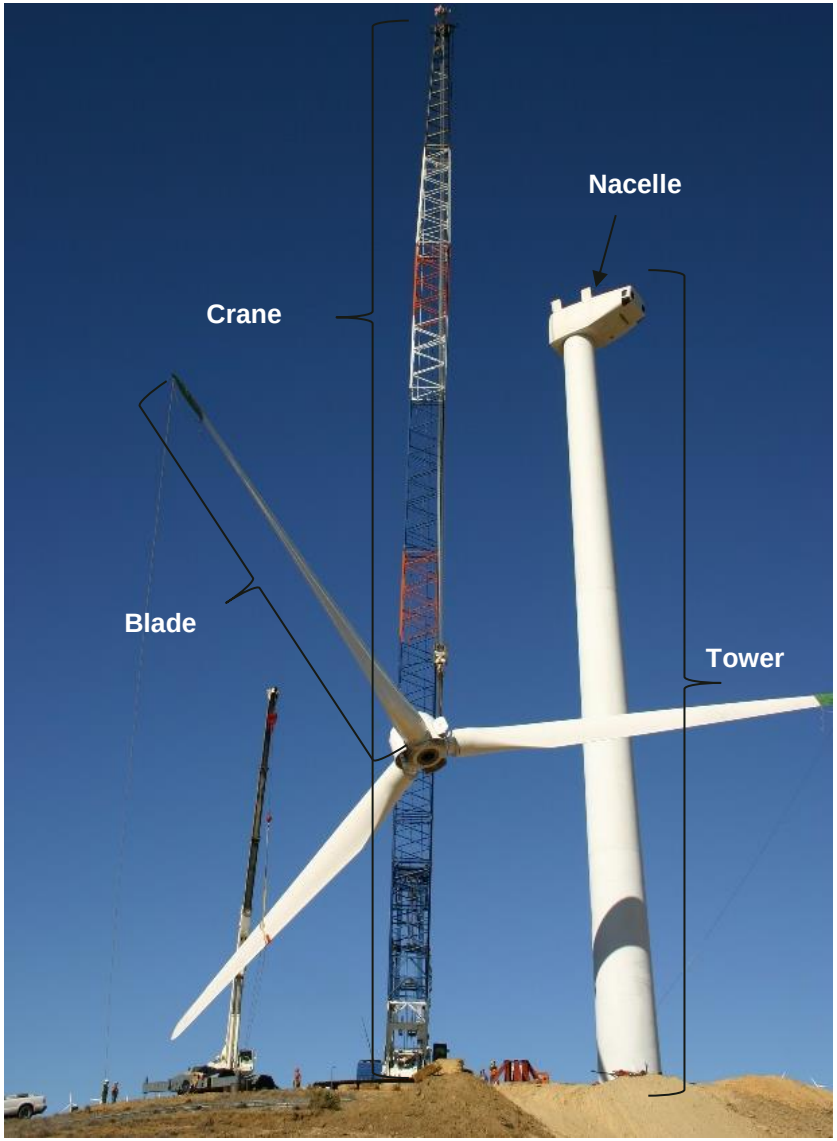


Figure 5.5: External components of a wind turbine tower

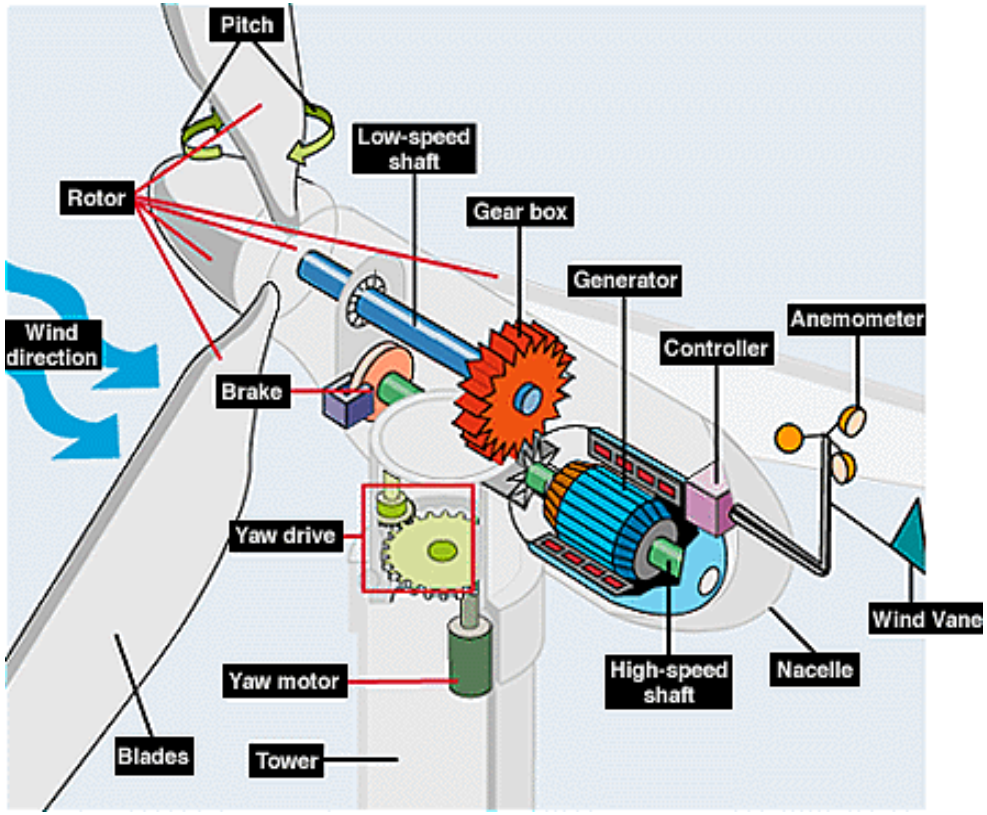


Figure 5.6: Internal components of a typical wind turbine

5.4.1.2 Nacelle

Larger wind turbines are typically actively controlled to face the wind direction, which is measured by a wind vane situated on the back of the nacelle. By reducing the misalignment between wind and turbine pointing direction (yaw angle), the power output is maximised and non-symmetrical loads minimised. The nacelle turns the turbine to face into the wind ('yaw control'). The nacelle also contains the generator, control equipment, gearbox and wind speed instrument (anemometer) to monitor the wind speed and direction.

The turbine controls the angle of the blades ('pitch control') to make optimal use of the available wind and avoid damage at high wind speeds. By turning the blades sideways into the wind, i.e. away from the direction of the wind ('furling'), the turbine ceases its rotation, accompanied by both electromagnetic and mechanical brakes. This would typically occur at very high wind speeds, typically over 72 km/h (20 m/s), depending on the characteristics of the specific turbine. The wind speed at which shut down occurs is called the cut-out speed. The cut-out speed is a safety feature which protects the wind turbine from damage. Normal wind turbine operation usually resumes when the wind drops back to a safe level.

5.4.1.3 Generator

The generator converts the turning motion of the blades into electricity. A gear box is commonly used for stepping up the speed of the generator. Inside the generator, wire coils rotate in a magnetic field to produce electricity. Each turbine has a transformer that steps up the voltage to match the powerline frequency and voltage for electricity evacuation / distribution. The transformer may be located inside the turbine tower, or within a small housing at the base of the tower.

5.4.1.4 Tower

The tower is constructed from tubular steel or concrete and supports the rotor and nacelle. Towers can vary in height and are dependent on the selected turbine. This height is referred to as "hub height." Wind has greater velocity at higher altitudes, therefore increasing the height of a turbine increases the expected wind speeds and electricity output.

5.4.1.5 Foundation

Foundations are designed to factor in both weight (vertical load) and lateral wind pressure (horizontal load). Considerable attention is given when designing the footings to ensure that the turbines are adequately grounded to operate safely and efficiently. The final foundation design of the proposed turbines is dependent on a geotechnical investigation.

As depicted on Figure 5.2, the project has been designed to have up to 29 wind turbine locations. 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 (see illustration in Figure 5.4).

With regards to the exact turbine model and specifications that would be developed, it is not possible to finalise this decision until closer to the construction period. This is because turbine technology is continually improving globally and it is not possible at this early stage of the project to know the exact turbine model and specifications that would be available at the time of development. However, it is anticipated that the MW size of the turbine would be about 3-6 MW. Since the exact turbine model is not known, assumptions have been made as to the maximum possible area of impact by the potential turbine blades based on a range of turbine sizes. This area of impact is referred to as the "exacerbated rotor swept area envelope", as it 1) takes into account multiple turbine sizes at once, and 2) assumes each turbine has the largest blade it can from the lowest hub height and extends this all the way up to the highest hub height (see Figure 5.7).

Exacerbated rotor swept area envelope:

1. Rotor diameter: maximum of 150 m (75 m blade / radius)

2. Hub height: range from 90 to 120 m

3. Tip height: maximum based on 120 m hub + 75 m blade = 195 m

4. Tip height: minimum of 30 m (and not lower)

Resulting in an envelope between 30 m up to 195 m; 150 m wide, with a hub height within this between 90-120 m high.

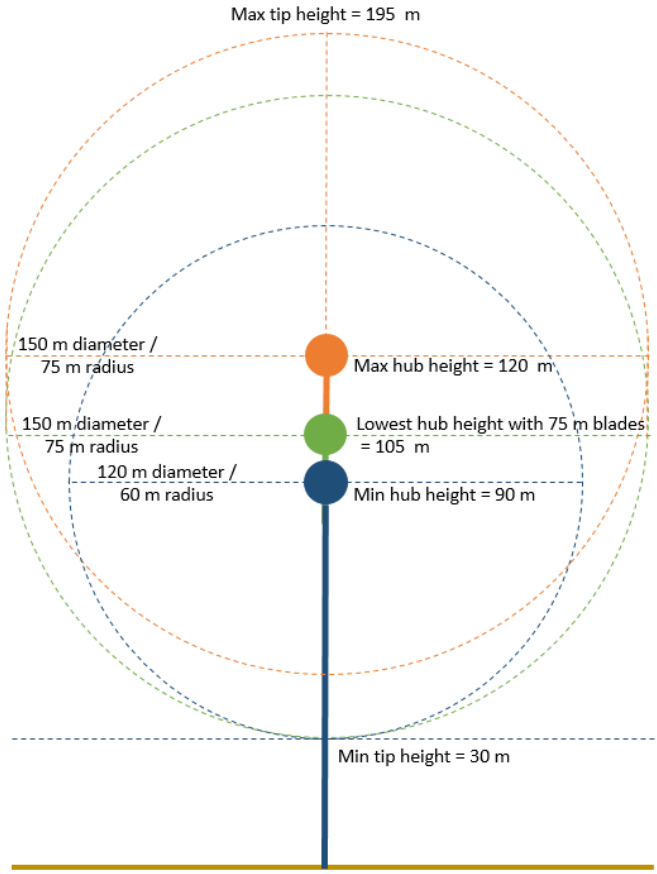


Figure 5.7: Exacerbated rotor swept area envelope

5.4.2 Transmission and distribution

The electricity generated by the turbines needs to be collected, transformed and then distributed to the national grid. The “step-up” process that occurs within the Impofu West substation will be included in this EIA process. However, the evacuation of electricity via a new powerline to connect to the national grid will be assessed in a separate BA process for the proposed Grid Corridor. The interface with the Grid Connection and the other Impofu Projects is shown on Figure 5.3.

5.4.2.1 Cabling

Each turbine will be connected to the substation via medium voltage cables (~33 kV lines). Where feasible, these cables will be laid underground in trenches, generally running alongside new or proposed internal roads. Where burying of cables is not possible due to technical, geological, environmental or topographical constraints, then overhead powerlines will be erected.

Figure 5.2 depicts the ‘Internal Roads including Cables’ showing the wind farm roads alongside which cables will also be buried. The ‘Cables alongside Public Roads’ is where cables are proposed to run alongside existing

public roads and the 'Off Road Cables' where cables that will not run alongside proposed or existing roads, and the 'Potential Overhead Power Lines' which all make up the internal powerline network.

5.4.2.2 On-site substation and transformer

The purpose of the on-site transformer and substation is to increase ("step-up") the voltage of the electricity from 33 kV to 132 kV. Energy produced by the turbines will be transmitted via medium voltage (~33 kV or lower) cables to the on-site substation named 'Impofu West Substation', refer to Figure 5.2. The substation facility will cover an area of approximately 11,250 m^2 (approximately 150 m x 75 m). The adjoining Eskom switching stations would be of a similar size. The substation area would house buildings or areas for control, operation, workshop and storage as indicated in Figure 5.4. A control room will measure power voltage, input, output, power fluctuation and other performance information. The remainder of the substation is comprised of facilities and infrastructure typical of a substation, including an area with a subterranean earthing mat, onto which a number of concrete plinths are constructed. This, together with a number of earthing rods, will provide an earth for lighting and possible short circuit currents. Switching gear, step-up transformers and protection equipment are also mounted on concrete plinths within the collector station. The adjoining Eskom switching stations would include equipment such as transformers and bus bars but are not part of this Application.

Figure 5.8: Substation / switching station

5.4.2.3 Grid Connection

A Grid Connection of approximately 120 km is required to evacuate the power generated by the proposed Impofu West Wind Farm (as well as Impofu East and Impofu North Wind Farms) to the NMBM Chatty substation.

The Proponent may either apply for an Independent Power Producer (IPP) contract in an upcoming bid round of the DoE's REIPPPP and therefore the power would be sold to Eskom; or the power could be sold to a Municipality or large private offtaker through a 'private to private' agreement.

This Grid Connection is the subject of a separate BA process and does not form part of this Application for environmental authorisation. The BA process is being undertaken in parallel with the Scoping and EIR processes for the three Impofu Wind Farms, so that the Final BAR can be submitted at a similar time as the Final EIRs for the Wind Farms. This will allow the competent authority to take into account the impacts of all four Applications at the same time during their decision-making process.

The Grid Connection includes the following components, as depicted on Figure 5.3:

Collector powerline

A 132 kV high voltage overhead line is required to link up the on-site Impofu West Substation, to a combined central collector switching station ('Impofu Collector Switching Station'). This line is approximately 4.5 km in length. The collector powerline is depicted on Figure 5.3 as the 'Impofu West Collector Line'.

Collector switching station

The role of the 'Impofu Collector Switching Station' is to consolidate the three power lines from Impofu North, Impofu East and Impofu West Wind Farms into one, such that a single line continues from here onwards. This will also allow Eskom more control over the management of the wind farms' connections into the national grid. The Impofu Collector Switching Station will cover an area of approximately 11,250 m^2 (approximately 150 m x 75 m) and is depicted on Figure 5.3.

Powerline from the consolidated site to PE

The remaining 132 kV overhead power line is approximately 115 km in length and travels from the Impofu Collector Switching Station through the Eskom Melkhout substation located just north of Humansdorp and will continue to the western outskirts of Port Elizabeth (PE) where it connects into the NMBM Sans Souci substation. From Sans Souci substation the line then continues to the NMBM Chatty substation where the grid connection terminates. The reason the power line goes through the Eskom Melkhout substation and the NMBM Sans Souci substation is to improve the evacuation capacity and technical parameters of the grid connection, as well as improving the overall stability and reliability of the Eskom and NMBM networks.

5.4.3 Additional infrastructure

5.4.3.1 Access, service roads and sidings

Access from the N2 would be from either Exit 632 (Palmietvlei off ramp onto DR01776), or the Exit 647 (Kareedouw off ramp onto TR04403). The site can be accessed from DR01774, DR01765 and MN50032 and DR01764.

Internal access and service roads will be required to access the wind farm area as well as each turbine site. These roads are shown as 'Internal Roads including Cables' on Figure 5.2. Further information on access is detailed in the Traffic Impact Assessment (TIA) in Section 6.13 and Appendix E11.

The internal gravel roads will be approximately 6 m wide with potential side drains along the side and of a specification to accommodate the abnormal trucks that will deliver the turbine components. Where possible, existing roads have been proposed to be upgraded to avoid additional clearance of natural or agricultural land cover. New roads will be established where needed. In exceptional circumstances short sections of the roads may be surfaced with bitumen or concrete if they are excessively steep. More information on access roads for haulage is provided in Section 5.6.

5.4.3.2 Fencing

A security gate and associated guard house may be placed at the entrance to the wind farm site. This is aimed at preventing unauthorised vehicular access to the facility. No fencing will be used around individual turbines themselves and existing fencing will remain around the perimeter of the properties. This will enable livestock and wild fauna to continue to utilise the area underneath the turbines as rangeland or a migratory corridor. Fencing up to 3 m high will be erected around the onsite substation and operations and maintenance complex for security and safety reasons during the operational phase. The temporary construction camp (described further below) will also be fenced and should be kept secure for the duration of the construction period. Additional construction phase fencing will be brought on where needed in consultation with landowners.

5.4.3.3 Water and electricity

A preliminary approximation of the water requirements for the construction phase of the proposed wind farm are as follows:

- During the construction period (18 - 24 months) water will largely be used for the following: road construction; hardstand compaction; concrete foundations; cleaning equipment after concrete pours and dust suppression on roads. It is anticipated that 80,000 m^3 will be used during construction.
- During the operational phase (approximately 20 years) water would be required for road maintenance, for the grading and re-compacting of the roads. It is anticipated that water consumption would be approximately 2,000 m^3 per annum.

Several water header tanks will be used to provide potable water. Potable water will be sourced from the property, or neighbouring farmers (under agreement) and piped or trucked to site as required during the construction and operational phases.

Basic sanitation will be provided on site during the construction and operational phases in the form of portable toilets and conservancy tanks. Wastewater will be collected at regular intervals and transported to the Municipal Waste Water Treatment Works.

Electricity for construction could be obtained from Eskom, temporary diesel generators and possibly small scale mobile photovoltaic units.

5.4.4 Temporary infrastructure

5.4.4.1 Construction yard

As depicted on Figure 5.4 above, a temporary yard is required during construction and is proposed to have a total footprint of 15,000 m^2 (1.5 ha). One preliminary area has been identified near the Impofu West substation site; this location will be confirmed by the Contractors and if alternative locations are considered preferable, they will be outside the 'Buildings No-Go' areas shown in Appendix D and approved by the ECO. This yard will be used to centralise the construction related activities and will include the site offices, ablutions, canteen, parking and storage areas (for fuel, oil, waste, other materials and equipment). Typical heavy machinery required for civil engineering construction and earthworks that will be stored and maintained at the yard includes excavators, trucks, graders, compaction equipment, cement trucks, water bowsers etc. In addition, specialised construction and lifting equipment (cranes etc.) required for turbine construction may be stored at the yard or at the turbine sites. These areas will also be used for temporary laydown areas. The yard will be appropriately fenced.

5.4.4.2 Batching plant and stockpile area

An on-site concrete batching plant is required and will have a footprint of approximately 1,000 m^2. The concrete batching site will be located outside the 'Buildings No-Go' areas shown in Appendix D and approved by the ECO and will be located as centrally as possible and in the area of the site where most turbines are located (the eastern half of the site).

The plant will include storage bins, silos, bunkers and stockpiles for cement, water, sand and aggregate; plant and process equipment (e.g. front end loaders, conveyors, hoppers and agitators); bunded areas (egg concrete batching areas, truck washing areas, agitator washout areas, fuel storage areas); retention ponds and drains for contaminated stormwater and process wastewater; and tank for recycled wastewater. Recycled tank water will be used as soon as possible for activities that include concrete batching, spraying over stockpiles for dust control and washing out agitators. Waste concrete to be stored in a sealed pit where it will be dried and collected, then either reused (egg as a road base), or taken to a recycling facility or licensed landfill site.

5.5 Timeframes

It is unknown at this stage when construction would commence, as this would be dependent on the REIPPPP programme and other related permit requirements for a wind farm, however it is anticipated that construction would commence within the next five years. The construction period would be an anticipated duration of 18 – 24 months. Should decommissioning occur, this would only be likely after approximately 20 years as described in Section 5.8.4 below.

5.6 Materials, resources and haulage

A number of materials and resources would have to be brought onto site to facilitate construction. Furthermore, construction waste and spoil would be generated and would need to be transported offsite where not possible to reuse on the site.

The following items require haulage (as assessed in the TIA in Section 6.13 and Appendix E11):

- Construction equipment, such as tools, machinery, scaffolding, formwork, etc. will be delivered to site at the commencement of the construction;
- Gravel for the roads, sub-station platforms, roads and hardstand platforms adjacent to each turbine, worst-case scenario assumes that all material required (approximately 80,000 m^3) is sourced from commercial quarries, outside the study area (although it is anticipated that any suitable material excavated from the turbine foundations shall, where possible, be used for the construction of roads and hardstand platforms);
- Raw material for the concrete, assumed to be delivered to site from commercial sources: approximately 5,200 tons of cement, 9,000 m^3 of sand, and 10,500 m^3 of stone; and
- Turbine components, each turbine consists of approximately thirteen components, i.e. tower sections, blades, gearbox, nacelle, generator, nose cone, hub, etc., each of which are to be individually transported to site, most of which are abnormal loads. Most of the components are imported in to South Africa and will be delivered from the Ngqura Container Terminal near Port Elizabeth. Except for the tower sections which are fabricated locally and could be transported to site from Cape Town or PE.

During construction, internal roads are needed to accommodate low bed trucks delivering turbine components as well as the mobile high lift cranes where needed to erect the turbines themselves, amongst other heavy construction vehicles. Typical heavy loads are illustrated in Figure 5.9. Where necessary, road deviations to the final layout may be required to ensure that the corners are opened and gradients are reduced to accommodate the delivery of abnormal loads to the site. Roads may need to be widened up to 12 m to accommodate the vehicles. These internal haulage roads will be rehabilitated down to 6 m after construction is complete, or rehabilitated completely if the haulage road is no longer required as an access road during the operational phase.

Waste disposal will be disposed of in compliance with the relevant legislation and will be at a suitability registered waste facility.

Figure 5.9: Tower section in low load configuration shown in top photo; and blade shown in bottom photo

5.7 Employment

During the construction phase of the project, a significant number of temporary job opportunities will be created. These include highly skilled, semi-skilled and unskilled positions. The estimated Full Time Equivalent (FTE)[5] positions to be created during construction are 1,788 (180 direct, 1,138 indirect and 470 induced) as documented in Section 6.8 (Socio-economic). Similarly, the project will also generate permanent job opportunities throughout operation, estimated as 20 FTE direct and 52 FTE as indirect and induced opportunities, this is described further in Section 6.8 (Socio-economic). It is intended that preference will be given, as far as possible, to those people living in the area.

Neither construction nor operational staff will reside on the site and therefore they will be required to travel from their respective locations, namely Humansdorp, Jeffreys Bay, St Francis, Oyster Bay and Clarkson/Kareedouw.

5.8 Project phases

5.8.1 Pre-construction

Pre-construction activities involve tasks that establish the site. Typical activities associated with the pre-construction phase are summarised as follows:

- The site layout will be confirmed on site through a micro-siting process.
- The footprint boundaries and No-Go areas will be identified.
- Site clearance will occur for the formal laydown areas, turbine footprints, access routes, construction camps, on-site substation and other buildings or areas for control, operation workshop and storage.

[5] FTE refers to the total number of hours worked by one employee on a full-time basis.

- Storage areas for materials and spoil and topsoil stockpiles should be identified.
- Materials, resources, equipment and turbine components will be transported to the site. More information on materials, resources and haulage is provided in Section 5.6.
- Within the formal laydown areas, a maintenance and storage building along with a guard cabin will be established for the duration of the construction period as well as possible turbine tower construction areas, if concrete towers are used.
- Smaller manageable components of the turbines will be placed on the laydown areas, whereas larger more cumbersome structures, such as the blades, will likely be taken directly to the assembly point.

5.8.2 Construction

Typical activities associated with the construction phase are summarised as follows:

- The construction camp will be established along with batching plant.
- The internal roads to access the wind farm areas will be constructed; existing farm roads will be use where possible and upgraded (refer to Section 5.6 for information on haulage).
- Preparation of the crane hardstand for each turbine which will remain in place after construction (as described in Section 5.4.1.5).
- Construction of foundations for each turbine.
- Each turbine will be assembled in sections, refer to Figure 5.10 for an example.
- Connections to the overhead on-site substation will be developed in the form of trenching and laying of underground cables as well as installing pylons and stringing of the overhead powerlines.
- Rehabilitation during the construction phase will be undertaken in a phased approach and will continue into the operational phase.

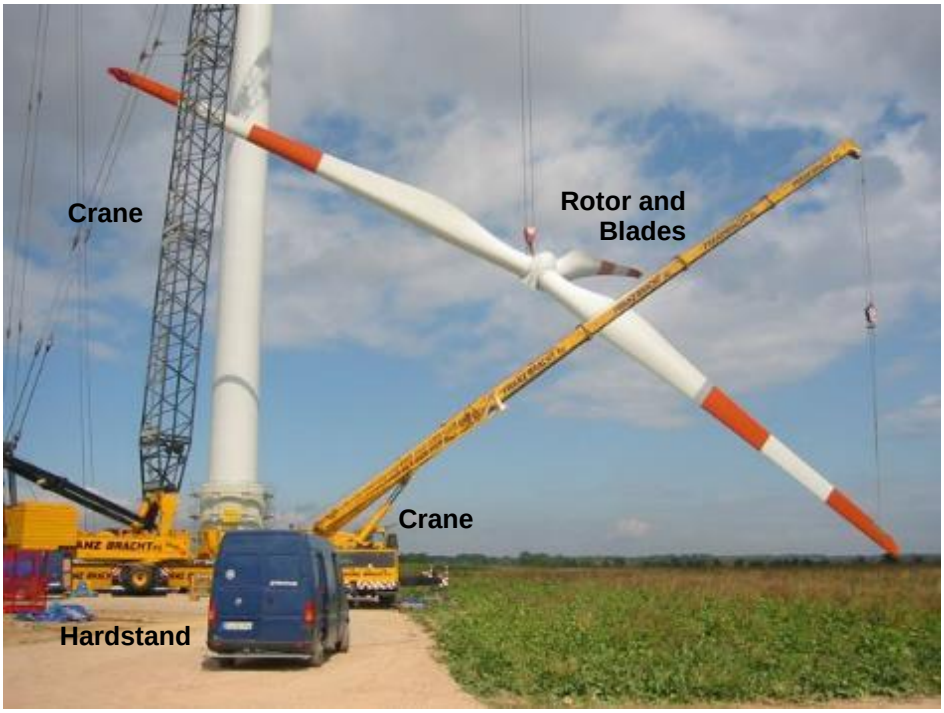


Figure 5.10: Wind turbine in the process of being assembled

5.8.3 Operation

During operation, the following activities will occur:

- The areas disturbed during the construction phase will be rehabilitated in a phased approach during the operational phase.

- The rehabilitated areas and areas unaffected by the turbines and associated infrastructure will remain available to the farmers as pasture, or retained as natural areas.
- There would be buildings or areas for control, operation, workshop and storage activities as indicated on Figure 5.4.
- Turbines are designed to operate continuously, unattended and with low maintenance for more than 20 years. Once operating, the proposed wind turbines will be monitored and controlled from the control room and also possibly remotely using telemetric systems. There will also be an operational team on site that monitors the wind farm and turbines and maintains the infrastructure.
- A post-construction monitoring programme for birds and bats will also continue into the operational phase for a minimum period of two years.

5.8.4 Decommissioning

The proposed project has an intended project lifespan of approximately 20 years, based on the mechanical characteristics of the turbines, and the fact that a maximum of a 20-year power purchase agreement can be signed with Eskom under the REIPPPP programme. At the end of the 20-year operational phase, the lifespan of the wind farm may be extended (subject to the necessary authorisations and agreements with the landowners, Eskom and the DoE), in which case the turbines may be refurbished / upgraded, or replaced with the latest turbine technology at that time.

Alternatively, should the lifespan of the wind farm not be extended beyond the 20-year operational phase, the facility will be decommissioned. Decommissioning is expected to take between 12 to 18 months and would include the following activities:

- Ceasing of electricity generation.
- Disconnection of the wind farm infrastructure from the electricity network.
- The components of the facility would be disassembled, then removed and reused or recycled as far as possible.
- All underground cables would be excavated and removed, or left *in situ* if appropriate.
- The buildings and associated infrastructure would be demolished and removed by an authorised company.
- Rehabilitation of the disturbed areas would be required, with the aim of restoring the land to its original characteristics (or as near as possible).
- A provision for rehabilitation will be made at the time the project is finalised and the bid is ready (and all the exact details like final number of turbines, type of turbine etc is known) and the provision will be part of the final financial model submitted to DOE and assessed by DOE as is standard practice in the bidding process.

5.9 Alternatives

The NEMA requires that alternatives are considered during the EIA/ BA process. An alternative can be defined as a possible course of action, in place of another, that would meet the same purpose and need (DEAT, 2004).

The 2014 EIA Regulations (GN R982), as amended, provide the following definition: *"alternatives", in relation to a proposed activity, means different ways of meeting the general purpose and requirements of the activity, which may include alternatives to the -*

a) property on which or location where the activity is proposed to be undertaken;

b) type of activity to be undertaken;

c) design or layout of the activity;

d) technology to be used in the activity;

e) operational aspects of the activity; and

includes the option of not implementing the activity" ("No-Go" alternative).

However, Appendix 2 (Contents of Scoping Report) of GN R982 of 2014, as amended, (2)(1)(g)(x), states that '*if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such*' should be provided in the Scoping Report and described in full. This was therefore reported in detail in the Scoping Report (Aurecon, 2018). Table 5.1 presents a summary of the alternatives that were considered at the Scoping Phase and it was concluded that only the preferred layout alternative will be assessed against the No-Go alternative.

Table 5.2: Alternatives for the Proposed Impofu West Wind Farm project

Alternative type	Alternative description
Location	The proposed project is located in an area of excellent wind conditions for wind energy generation and the Proponent has developed two other wind farms in the area. However, the Proponent also considered several potential alternative sites in the process, those in the Eastern Cape Province were discarded due to the presence of Cape Vulture roosts and those in the Western Cape and Northern Cape were discarded due to issues with the Square Kilometre Array (SKA) telescope and lack of grid connection possibilities. Therefore, location alternatives have been screened out of the EIA Phase.
Design and layout	A detailed Screening and Iterative Design Process which involved a multi-disciplinary team has served to identify all sensitive 'No-Go' areas specific to each environmental aspect for the various infrastructure components (turbines, internal overhead lines, roads and cables and buildings). These areas have subsequently been avoided in application of the mitigation hierarchy. This process was based on extensive field work and micro-siting and is considered to be adequately robust to ensure that all significant environmental impacts are avoided from the outset of the design process. Therefore, the layout alternatives have been screened out of the EIA Phase, and the preferred layout is assessed as the basis of this report.
Technology	Only horizontal axis wind turbines have been considered in this assessment as vertical axis turbines are not yet viable for large scale commercial purposes in South Africa. To allow for the fact that technology could evolve by the time of construction, a worst-case scenario of turbine specifications has been adopted to allow for a range of specifications. Therefore, technology alternatives have been screened out of the EIA Phase.
No-Go	The EIA includes an assessment of the project against the No-Go alternative. This alternative assumes that the proposed Impofu West Wind Farm will not be constructed and the status quo of the current farming activities will continue.

5.10 Need and desirability

The 'need and desirability' of the project should be evaluated against the strategic context of the development proposal along with the broader societal needs and public interest. According to the DEA Guideline on Need and Desirability (DEA, 2017), the concept of 'need and desirability' relates to the *"nature, scale and location of development being proposed, as well as the wise use of land"*. The concept of 'need and desirability' can be explained in terms of the broader meaning of its two components, need primarily referring to time, and desirability to place. It is acknowledged that 'need and desirability' are interrelated and the two components collectively should be considered in an integrated and holistic manner.

According to the DEA Guideline (DEA, 2017), the strategic context for the need and desirability of an activity can be reviewed in light of what is envisioned for a specific area, specifically what has been proposed in a municipal IDP and SDF. These planning tools provide direction as to the desired spatial form of a municipality. Similarly, municipal Environmental Management Frameworks (EMFs) also provide the desired spatial form in terms of the environmental context of an area. Furthermore, the DEA Guideline (DEA, 2017) states that the need and desirability of an activity should be evaluated against the principles of "*promoting justifiable economic and social development*" as well as the principles of "*securing ecological sustainable development and use of natural resources*" as set out set out in the bill of rights in the Constitution.

As introduced in Section 1.1 and supported by the numerous policies and legislation described in Section 3.3, the need for renewable energy is well documented. Wind energy is desirable as it:

- Creates a more **sustainable economy** by promoting South Africa's energy policy towards energy diversification;
- **Reduces the demand on scarce resources** such as water by promoting energy generating facilities which are less resource intensive;
- Assists in **meeting nationally appropriate carbon emission targets** in line with global climate change commitments by reducing reliance on coal as an energy source;
- **Reduces and, where possible, eliminates pollution** by using cleaner energy generating mechanisms and reducing the demand on carbon based fuels;
- Promotes local economic development by creating jobs and promoting skills development; and
- Enhances **energy security** by diversifying generation to reduce reliance on coal, which is non-renewable, as a primary energy source and promoting renewable energy generation.

Table 5.3 below aims to provide more detailed responses with regards to the project specific responses to the questions raised in the Need and Desirability guidelines of DEA (2017) and the Western Cape Government: Department of Environmental Affairs and Development Planning (DEA&DP) (2013). The responses were compiled taking into consideration the Eastern Cape Provincial Spatial Development Plan, Eastern Cape Climate Change Response Strategy, IDPs, SDFs, the Local Economic Development (LED) Strategy and the outcome of the project screening phase during which No-Go areas where identified based on environmental and socio-economic considerations (as described in Section 5.9).

Table 5.3: Need (timing) of the proposed project (based on the 2017 DEA and 2013 DEA&DP Guidelines)

Question	Response
1. Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved SDF agreed to by the relevant environmental authority i.e. is the proposed development in line with the projects and programmes identified as priorities within the Integrated Development Plan (IDP)?	Renewable energy projects have been prioritised in strategies at various municipal scales in the area. At the provincial level, the Eastern Cape Provincial Economic Development Strategy (2017) seeks to create a clear, long-term vision and strategy for the growth and development of the province by building on six high potential economic sectors, one of which is sustainable energy. The Eastern Cape Sustainable Energy Strategy (2012) lays out the province's strategic direction in terms of the renewable energy industry focusing on encouraging sustainable, affordable and environmentally friendly energy production by creating an enabling environment for energy production and sustainable technology, skills and industry development. The Sarah Baartman District Municipality IDP identifies investment in renewable energy, particularly wind, as potential projects with significant economic spinoffs for the region. It also identifies renewable energy investment as a key means by which to address the electrical infrastructure backlog within the district. The Sarah Baartman District Municipality SDF acknowledges this economic opportunity, but also considers the potential negative impact on ecotourism of the district due to the potential changes to the visual and cultural landscapes. Within the Kouga (and neighbouring Koukamma) Local Municipality, renewable energy (specifically wind farms) have been identified as key contributors to the economy of the municipality. The LED and SDF consider the role of the municipality manging potential conflicts with other economic development initiatives.
2. Should development, or if applicable, expansion of the town/ area concerned in terms of this land use (associated with the activity being applied for) occur at this point in time?	Yes. The proposed project is in line with the Sarah Baartman District Municipality's medium term strategic framework that focuses on investment in alternative energy sources, e.g. wind, that will stimulate secondary opportunities for economic growth.

Question	Response
	The proposed project also has both national and global significance as it aligns with national policy direction as well as contributing to South Africa being able to meet some of its international climate change obligations, by aligning domestic policy with internationally agreed strategies and standards as those set by the United Nations Framework Convention on Climate Change. Other reasons why timing is considered to be right for renewable energy within this landscape includes firstly, the nearby location for the proposed Thyspunt nuclear energy facility that was not selected as the preferred site for nuclear in South Africa in the long term. Secondly, with the recent construction of nearby wind farms in the landscape, a host of locally based manufacturing and training facilities have been established in the surrounding areas like Port Elizabeth.
3. Does the community/ area need the activity and the associated land use concerned (is it a societal priority)?	Yes. The Sarah Baartman District Municipality identifies a green economy (including, but not limited to renewable energy and ecosystem services) as a focal point for economic development in the district, noting that such investments are likely to have significant economic spinoffs for the region. The proposed Impofu West Wind Farm, along with Impofu North and Impofu East Wind Farms and the Grid Connection, would also directly benefit the local community. Firstly, it would be a source of income to the landowners of the properties on which the wind turbines are located, and would improve the economic viability of the landowner's current farming operations. Secondly, it would also create direct, indirect and induced job opportunities for the local community; who have already been exposed to the work required since the construction of the surrounding existing wind farms. Secondary economic benefits may include an increase in service amenities through an increase in contractors and associated demand for accommodation and other services. A percentage of the operational revenue of the project will be utilised to support local socio-economic development initiatives, due to the requirements of the REIPPPP. The local municipality will play a strong role in guiding how the funds are utilised, thus ensuring that relevant and pressing needs in the community will be addressed.
4. Are there necessary services with appropriate capacity currently available (at the time of application), or must additional capacity be created to cater for the development?	No municipal services (water, sewerage, electricity) will be required at the site, as the project contractor or appointed sub-contractor/s will be responsible for providing the necessary services to the site during the construction and decommissioning phases. Electricity will be supplied to the site via existing Eskom lines, generators and/or on-site renewable energy installations (e.g. solar panels). Waste produced at the site will be collected and taken to an appropriate facility with sufficient capacity to accept the waste, for recycling, re-use, treatment or disposal (as appropriate). No municipal waste collection will be required at the site. However, the capacity of the municipal waste streams will need to be determined prior to construction. It is unfeasible to consider this during the EIA process as construction of this project may only begin in more than three years, if the project is granted all authorisations and should the project be submitted into a future bidding round, then once it is selected as a preferred bidder in terms of REIPPPP. Should any need for other services arise the relevant authority will be communicated with, and the necessary approvals/ agreements obtained before proceeding.
5. Is this development provided for in the infrastructure planning of the municipality, and if not, what will the implication be on the	Yes. Although the proposed project is not specifically mentioned in the municipal planning reports, reference is however made of wind energy projects within the Sarah Baartman District Municipality's jurisdiction.

Question	Response
infrastructure planning of the municipality (priority and placements of services)?	The SBDM's IDP further notes that both the national and provincial governments have prioritised renewable energy, with the Eastern Cape placing particular emphasis on wind energy. The municipalities (Sarah Baartman and Kouga) IDPs concurs with this, identifying the development of wind farms as major economic projects that have the potential to create employment and address poverty in the area. The proposed development will have little bearing on the infrastructure planning of the municipality and will be situated on privately owned land. Water, sanitation and electrical services required for the construction of the project will be provided by the appointed contractor, and additional municipal services are not expected to be required for the proposed development (e.g. potable water will be piped from sources on site or trucked to site, wastewater will be collected in conservancy tanks and transported to an appropriate wastewater treatment site, on-site generators will be utilised etc.). Should municipal services be required, these will be confirmed and agreed with the municipality prior to commencing. Should the municipality be unable to provide the necessary services, then the applicant (or their appointed contractor) will be responsible for providing the necessary services to the site via use of private service providers.
6. Is this project part of a national programme to address an issue of national concern or importance?	Yes. The establishment of the proposed project would maintain the national DoE mandate to ensure efficient supply of electricity to service the South African economy and society by strengthening the existing electricity grid for the area. In 2015 South Africa experienced serious energy constraints which was a barrier to economic growth. The proposed development is thus an issue of national concern and importance. Moreover, the project would contribute towards meeting the national energy targets as set by the DoE, of which a share of all new power generation being derived from IPPs. The 2010 Integrated Resource Plan (IRP) developed by the DoE for the 2010 to 2030 period aims to achieve a "*balance between an affordable electricity price to support a globally competitive economy, a more sustainable and efficient economy, the creation of local jobs, the demand on scarce resources such as water and the need to meet nationally appropriate emission targets in line with global commitments*". The final IRP provides for an additional 20,409 MW of renewable energy in the electricity mix in South Africa by 2030. Furthermore, the National Development Plan (NDP) proposes to create 11 million jobs and grow the economy at an average rate of 5.4% per annum by 2030. In respect of renewable energy, the NDP seeks to ensure that half of the new future generation capacity comes from renewable energy sources. It furthermore recognises the importance of the transition to a low carbon economy. As such the NDP suggests the following: • Supporting carbon budgeting. • Establishing an economy wide price for carbon by 2030 complemented by energy efficiency and demand management interventions. • Setting a target of 5 million solar water heaters by 2030. • Implementing zero emission building standards that promote energy efficacy. • Simplifying regulatory regime to encourage renewable energy, regional hydroelectric initiative and independent power producers (IPPs). An update to the IRP was drafted by the Department of Energy (DoE) and circulated for a 60-day public comment period in August 2018. The draft IRP (2018) indicates that the expected electricity demand for South Africa has

Question	Response
	decreased and that no new nuclear will be planned up until 2030. Of the new build planned by 2030, 52% (18,746 MW) will come from renewable energy, half of which will be wind energy (9,462 MW).
7. Do location factors favour this land use (associated with the activity applied for) at this place?	Yes. The suitability of the site includes one of the best wind resources in the country as it lies on a section of coastal plain near Cape St Francis and is therefore exposed to winds from the ocean from the south-west and south-east. The area is therefore already host to a number of operational wind farms and this project could be considered as 'infill' amongst these. The location favours the proposed land use also based on the ability of wind energy to operate in conjunction with beef/ dairy farming which is the current main land use on site, with negligible impacts to agricultural production as documented by Lanz (2019) in Section 6 and Appendix E5). The project also has the support of the landowners concerned. Although the socio-economic and visual specialist found no major tourism attractions located on the proposed site, the study area is in proximity to several important tourism attractions including the resort town of Oyster Bay to the south, with Oyster Bay Lodge just to the west of it, Huisklip Nature Reserve and private game farms such as Jumanji and Thaba Manzi to the north. Of these, the game farms are the only areas considered to have a notable visual impact based on viewshed mapping. The socio-economic specialist, in consultation with local tourism authority, concluded that tourism is unlikely to be impacted. Refer to the Visual and Socio-economic Specialist Studies (Section 6 and Appendix E). Therefore despite the visual impacts, the activity does not seem to have any significant conflict with current land uses, especially since the area is already characterised by wind farms.
8. Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area? Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programmes?	According to the Socio-economic Specialist Study (see Section 6 and Appendix E6), the proposed project would have positive impacts related to GDP growth, limited local and preferential procurement (BBBEE, women-owned vendors, etc.), enterprise development, the creation of employment and skills development opportunities, which is compatible with the economic development vision of the SBDM and Kouga Local Municipality. The Sarah Baartman District Municipality Socio-economic and enterprise development (SEEDS) strategy (2016) identifies seven core strategies based both on international trends and other institutions in promoting development in the region. One of the core strategies is "*investment in natural capital which includes creating* ***new generation green jobs*** *and* ***local income streams rooted in renewable energy***". The proposed development is aligned to the LED and SEED strategy. According to the Sarah Baartman Municipality (2017) the district aims to increase the rate of economic growth to create decent job opportunities and sustainable livelihoods. This includes continued investment in infrastructure, local economic growth and tourism that is supported by adequate services such as employment and electricity. The proposed project would create both employment and business opportunities, as well as an opportunity for skills development and on-site training.
9. What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	The potential for the proposed project to negatively impact on the natural, social and economic environments have been recognised and a number of investigative steps have been identified to ensure a good understanding of these potential impacts throughout the project's life cycle. The first step involved a screening exercise undertaken with specialists which resulted in a proposed layout which minimised impact to sensitive receptors as far as possible (especially in terms of noise and shadow flicker, Appendix E9). The Scoping and EIA Phase has identified further measures to minimise and

Question	Response
	reduce any residual environmental or social impacts, an additional study of relevance is the TIA (Section 6 and Appendix E11). This EIR includes an EMPr that will be applicable to the pre-construction, construction, operational and decommissioning phases of the proposed project (see Section 5.8) to ensure that an environmentally and socio-economically sustainable "cradle to grave" approach is implemented. The EMPr is to be managed and implemented as a living document, to allow the development project to adapt to and accommodate unforeseen environmental and/or social and/or political and/or economic changes and needs. Refer to Appendix F for the EMPr.
10. What measures were taken to ensure the participation of all interested and affected parties? What measures were taken to ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge?	The regulated EIA processes are tightly bound by legislative timeframes in terms of NEMA, and thus provide limited opportunity to incorporate and respond to issues raised by I&APs. In a **precautionary approach**, focus group meetings have been undertaken with key stakeholders, authorities and landowners and an additional public comment period will be implemented prior to the official commencement of the Scoping Phase (linked to the submission of the application form to DEA) to enable the project team to better incorporate and communicate the views of the I&APs into the proposed development. Please refer to Section 4.4 for more detail on the public participation process undertaken to date and proposed for the remainder of the project.
11. Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area.	As concluded in Section 7, the net effect of the proposed project from a socio-economic perspective during both the construction and operational phases would be positive. Under both identified scenarios the same type of impacts will arise. This includes stimulation of local and national economy (moderate positive), job creation (moderate positive), increase in household earnings (minor positive), and increase in government revenue (minor positive) with some negative impacts being change in sense of place (moderate negative), impact on property and land value (negligible negative), and impacts to social and economic infrastructure from the influx of people to the area (minor to negligible negative with mitigation). Other than the latter, all of these impacts remain the same with mitigation. Scenario 1 will be of greater significance than for the project and Scenario 2 will be greater than Scenario 1.
12. Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources for the proposed development alternative?)	Yes. Renewable energy projects have been prioritised in strategies at various municipal scales in the area. At the provincial level, the Eastern Cape Provincial Economic Development Strategy (2017) seeks to create a clear, long-term vision and strategy for the growth and development of the province by building on six high potential economic sectors, one of which is sustainable energy. The Eastern Cape Sustainable Energy Strategy (2012) lays out the provincial strategic direction in terms of the renewable energy industry focusing on encouraging sustainable, affordable and environmentally friendly energy production by creating an enabling environment for energy production and sustainable technology, skills and industry development. Although some of the infrastructure for the project would be located on productive agricultural land, the case study undertaken by the agricultural specialist (Lanz, 2019) reveals that the wind farm infrastructure would have an added benefit to the local farmers by providing an alternative income source that would improve the economic viability of existing farming operations. Overall impacts on agricultural production are deemed negligible. The opportunity costs are thus deemed acceptable. Please also refer to Section 6 for further detail on potential issues and recommendations with regards to anticipated agricultural and socio-economic impacts.
13. What measures were taken to pursue environmental justice so that adverse	Stakeholder engagement is as an important aspect of sustainable development to ensure that adverse environmental impacts are appropriately

Question	Response
environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)?	addressed and not result in discriminating distribution of these impacts. For this reason, the public participation process has been expanded to beyond what is legally required and to enable the project team to better incorporate and communicate the views of the I&APs into the proposed development. Furthermore, the Proponent has demonstrated their commitment to the local community by being part of the Greater Kromme Stewardship initiative which allows private and communal landowners to directly participate and benefit from conservation by securing legal conservation status for their land, and which encourages and supports additional investment, from both the private and government sector into good environmental management.
14. What measures were taken to ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge?	Public participation has included focus group meetings undertaken with key stakeholders, authorities and landowners to inform the proposed development. The Gamtkwa Khoisan Council were also provided an opportunity to provide preliminary input. Public meetings in the area were also held to communicate the project details and gather local information. The public participation process as required in terms of NEMA is described in Section 4.4 and Appendix C of this report.
15. How was a risk-averse and cautious approach applied in terms of socio-economic impacts?	Screening was undertaken at the pre-feasibility stage to allow environmental and social impacts to be considered early in the project lifecycle and evaluated in an integrated manner with the engineering design considerations. The screening process was specifically based on the identification and mapping of No-Go areas of the site to avoid all environmental, socio-economic and technical sensitive areas, and considered both impacts from turbines and other infrastructure (internal overhead power lines, roads, and underground cables and buildings) as separate No-Go layers. The results of the screening study showed that the project is viable and that there are no fatal flaws that should prevent the project moving forward. Specialist studies on the revised layout have been undertaken to refine results, improve knowledge gaps and confirm mitigation measures required where impacts cannot be avoided altogether. Please refer to Section 4.5 for detail on assumptions, limitations and gaps in knowledge.

Table 5.4: Desirability (placing) of the proposed project (based on the 2017 DEA guideline and 2013 DEA&DP Guideline

Question	Response
1. Is the development the best practicable environmental option (BPEO) for this land/ site?	The land use within the project site boundary is primarily dairy farming which co-exists very well with wind farms and impacts on agricultural production as the dominant land use and economic activity has been found to been negligible (refer to Section 6 and Appendix E5). During the Screening and Iterative Design Phase a screening exercise with the project specialists was undertaken and No-Go areas where mapped and incorporated in the proposed layout, this layout was further refined based on public participation and the results of the bat and bird monitoring. Refer to Section 4 for further detail.
2. How will this development use and/or impact on non-renewable and renewable natural resources and the ecosystem of which they are part?	The screening process was undertaken in support of the mitigation hierarchy advocated in NEMA to **avoid** and minimise impacts as the most preferred approach to mitigation. This process and the outputs were collaborative and involved a large multi-disciplinary team of environmental specialists, the EAP, the project engineers and Red Cap as the developer, most of which have extensive knowledge of the area and experience in wind farm assessments generally. The results from this exercise (i.e. the preferred project layout as documented Section 5) has been further refined during the scoping and EIA

	phases to further minimise the effect of potential negative impacts and enhance positive impacts to ensure an environmentally sensitive and sustainable project is taken forward. Please also refer to Response 12 in Table 5.3 for more information on why the proposed use of natural resources is considered to be the best use thereof.
3. Would the approval of this application compromise the integrity of the existing approved Municipal IDP and SDF as agreed to by the relevant authorities?	No. The proposed development aligns with the Municipal IDP's which recognises the need for development of renewable energy and pursues economic development through renewable alternatives and promotion of energy efficiency. A focus group meeting was also undertaken with key stakeholders that included the municipalities, to involve them with the planning process and to better incorporate and communicate the stakeholder's views into the proposed development. No fatal flaws or issues compromising IDPs and SDFs have been raised by municipal representatives to date.
4. Would the approval of this application compromise the integrity of the existing environmental management priorities for the area (e.g. as defined in Environmental Management Framework (EMF)), and if so, can it be justified in terms of sustainability considerations?	No. Currently there is no EMF adopted by the Kouga Local Municipality. However, the Eastern Cape Biodiversity Conservation Plan (ECBCP), which sets out the land use objectives spatially, has been considered in the listed activities of the project. A screening exercise has also been undertaken with the specialists to identify and exclude No-Go areas from the proposed development footprint (see Section 4.2). These results will be refined even further as the EIA process progresses and more detailed specialist assessments become available.
5. How will the activity or the land use associated with the activity applied for, impact on sensitive natural and cultural areas (built and rural/ natural environment)?	As mentioned in Response 1, a screening exercise was undertaken to remove sensitive No-Go areas from the proposed layout area. Information on potential impacts related to natural and cultural areas are available in Section 6.
6. How will the development impact on people's health and wellbeing (e.g. in terms of noise, odours, visual character and sense of place, etc.)?	Preliminary impacts were identified during the screening exercise and the results have been incorporated in the current proposed wind farm layout plan. The revised turbine layout has helped to reduce the siting of the proposed wind turbines in visually sensitive areas and recommendations have been provided to further reduce the visual impact where possible (see Section 6.12). Noise impacts to sensitive receptors were reduced originally through application of a 500 m buffer area around each potential receptor (see Section 6.11). Further mitigation to address residual impacts is addressed in the respective sub-sections of Section 6.
7. How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage?	A palaeontologist and archaeologist were appointed to undertake specialist investigations that would contribute towards the Screening, Pre-Application, and Scoping and EIA phases of the project. No-Go areas were identified during the screening phase, and have been avoided in the layout of the proposed infrastructure. The findings of these specialist assessments are complemented by previous heritage investigations undertaken in the area by the Eastern Cape Heritage Consultants, and the preliminary conditions of support from the Gamtkwa Khoisan Council, who have been engaged in the process. In addition, the sensitive areas associated with the pre-colonial cultural landscape reported on by the Eastern Cape Heritage Consultants (Binneman and Reichert, 2017) have also been avoided by the proposed development. For more detail on potential impacts related to heritage resources, please refer to Section 6.
8. Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its	As concluded in Section 7 and 8, the cumulative impacts depend largely on application of the project specific mitigation identified in Section 6. Many of the impacts were rated as negligible or minor negative significance, however there were a few negative moderate impacts of concern and one high residual impact.

location and other planned developments in the area.	It was found that other than the potential high impact of bird mortality from the turbines which can be mitigated and is based on a worst-case scenario (moderate significance for overall combined cumulative impact on birds) there are no other major negative impacts or any that will exceed a critical threshold through the development of the project. All efforts to mitigate any residual project specific impacts should be pursued and contribution to the Greater Kromme Stewardship Initiative should be considered to contribute to local bioregional conservation efforts.
9. Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives / targets / considerations of the area?	The approach developed for this project is based on the precautionary principles of NEMA and aimed to avoid and minimise impacts as the most preferred form of mitigation, as identified through spatial plans, specialist desktop and site based research, and stakeholder engagement. However, all impacts cannot be avoided and these are therefore assessed as part of the Scoping and EIA phases of the project with the support of specialist assessments. To minimise, manage and remedy the potential residual negative impacts, and enhance the positive impacts throughout the project cycle, mitigation measures are proposed and the details thereof are included in Section 6 and in the EMPr (Appendix F). Since the main footprint impacts have been avoided, the residual impacts on terrestrial and aquatic ecology are deemed acceptable by their respective thresholds. However acceptable bird thresholds are not developed and are complex to calculate but the fatality rates are considered moderate for the identified species. Bat thresholds have been calculated and operational monitoring will indicate if there is an exceedance. Key mitigation will therefore include construction monitoring (birds), operational monitoring (birds and bats), with adaptive mitigation, as well as the development and implementation of a stormwater management plan and a wetland and watercourse rehabilitation plan post environmental authorisation. Furthermore, the Proponent is part of the Greater Kromme Stewardship which was established by a group of wind farms (Kouga, Jeffrey's Bay, Gibson Bay, Tsitsikamma Community, Oyster Bay Wind Farms and a wind farm developer called WKN Wind Current) and aims to identify and conserve important habitats and species found in the Kouga area where the wind farms operate, as well as secure ecological processes and ecosystem services.

6 Baseline environment and potential impacts

As described in Section 4, several environmental aspects were identified during the Scoping Phase that may be impacted upon by the proposed wind farm and associated infrastructure. During the Scoping Phase, sensitive areas were mapped for each environmental aspect and were provided to the Proponent and engineering design team. The environmental No-Go areas were avoided in the placement of the turbines and associated infrastructure during this EIR phase. The mapped No-Go areas, superimposed by the proposed project layout (preferred alternative) is illustrated on the following page in Figure 6.1 and as an A3 map in Appendix D. The No-Go areas differ per infrastructure (overhead lines, roads and cables and buildings) and are depicted on infrastructure specific maps in Appendix D.

Several impacts (positive and negative) specific to the proposed Impofu West Wind Farm have been identified and assessed by both the EAP and relevant specialists in this section. Potential cumulative impacts caused by the wind farm in addition to other renewable energy projects in the area (within a 30 km radius) are assessed in Section 7.

For each impact assessed, mitigation measures have been proposed to avoid, reduce (negative) or enhance (positive) the impacts. These mitigation measures have also been incorporated into the lifecycle EMPr to ensure that they are implemented during the pre-construction, construction, operational and decommissioning phases. The EMPr forms part of the EIR (Appendix F), and as such, its implementation will become a binding requirement should this project be authorised.

The following environmental aspects are discussed in this Section:

- Climate
- Topography, geology and soils
- Terrestrial ecology
- Aquatic ecology
- Bats
- Avifauna
- Agriculture
- Socio-economic
- Palaeontology[6]
- Archaeology
- Noise and shadow flicker
- Visual
- Traffic
- Wake effect

For each of these sections, a brief introduction is provided giving context to the study. This will be followed by a description of the current environment, building on what was identified during the Scoping and EIR Process. An assessment has been undertaken for each impact assessed within the context of the environmental aspect, which has been presented in a table format, linking the proposed mitigation measures to each impact. Following this, the No-Go alternative is discussed. In conclusion to each environmental aspect, an impact statement is presented, which provides a summary of the nature of the impacts and the mitigation measures recommended to reduce the impacts associated with each environmental aspect. By understanding these associations, it is possible for the DEA to ensure that appropriate impacts have been assessed, and suitable mitigation measures recommended, resulting in a robust EIA process.

[6] Palaeontology was scoped out of the EIA however, information has been included for context and motivation and excludes a detailed impact assessment.

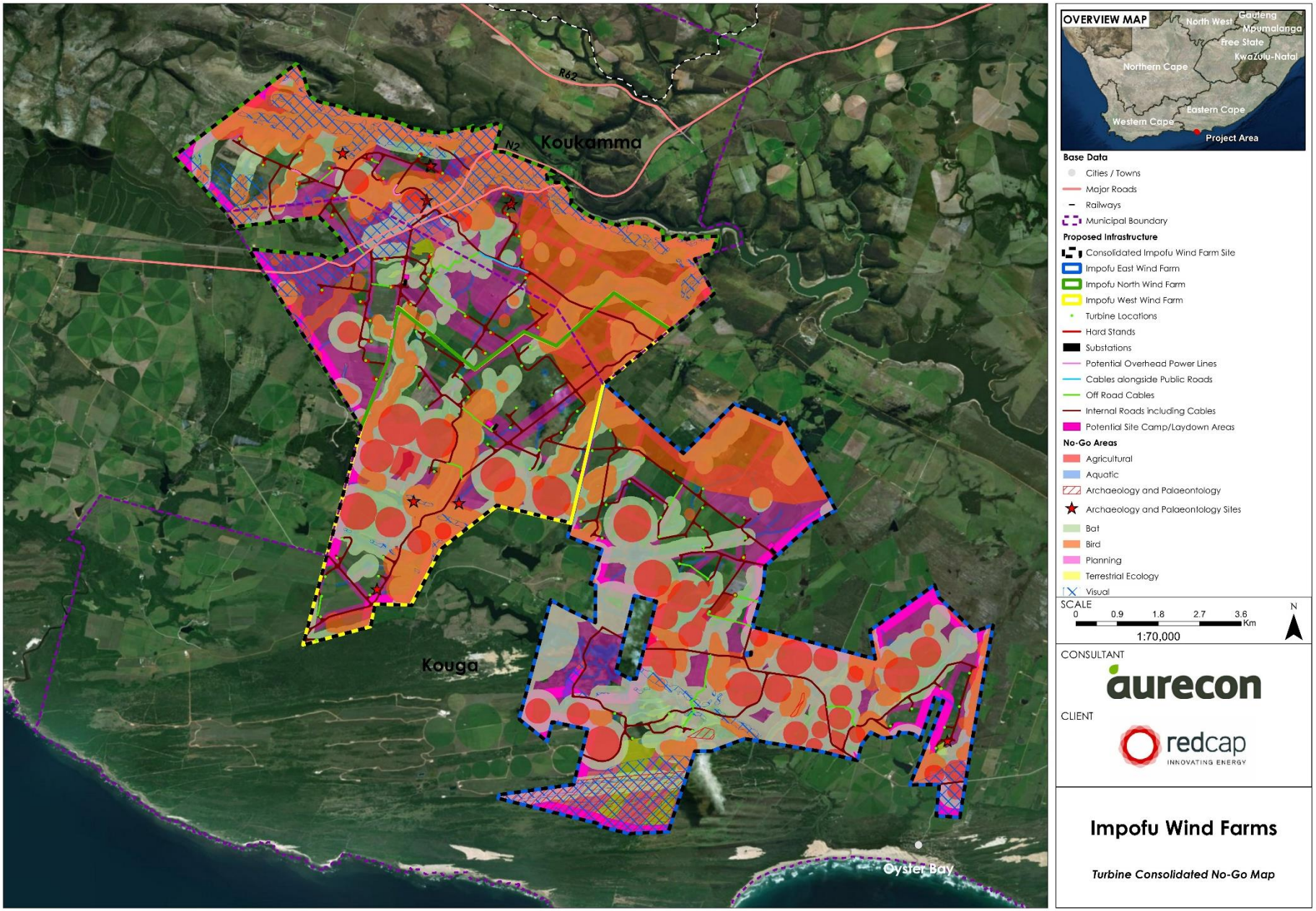


Figure 6.1: Planning and environmental consolidated No-Go areas for proposed turbines showing the proposed turbine locations (Impofu West Wind Farm outlined in yellow)

6.1 Climate

Climate plays an important role in the technical feasibility of siting a wind farm. Additional climatic conditions also influence the rest of the environmental aspects indirectly and it is therefore necessary to consider these climatic conditions.

According to the Köppen-Geiger climate classification (Britannica, 2018), the site falls within the marine temperate climate region of South Africa which is characterised by frontal weather, leading to changeable often overcast and moderate weather conditions. The District municipal area's climatic conditions vary from mild with moderate rainfall along the coast to harsh conditions and low rainfall inland. The municipal area experiences an average summer temperature of 23°C, and a winter average of 17°C. The study area receives an average rainfall of up to 662 mm per annum (The World Bank Climate Change Knowledge Portal, 2018) with rainfall distributed throughout the year. The area is generally described as windy. Figure 6.2 illustrates the average temperatures and precipitation levels over a calendar year.

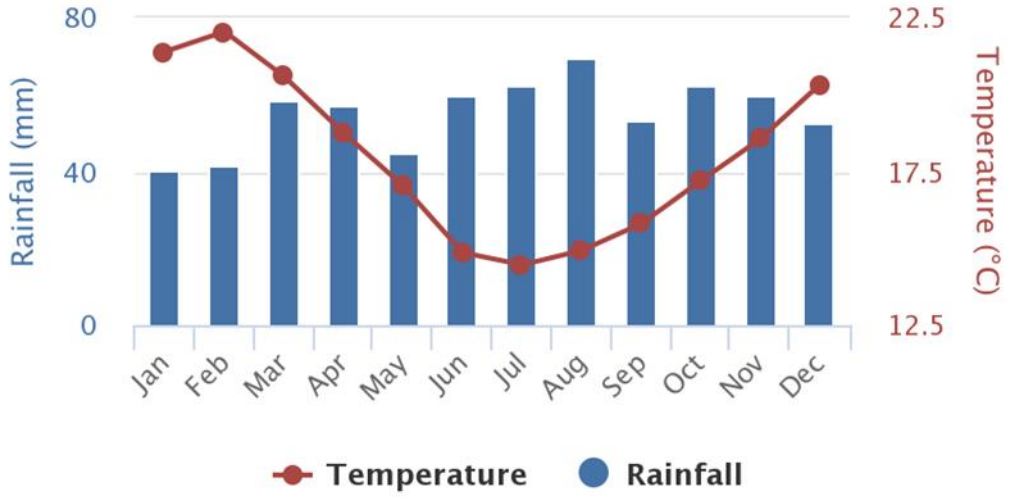


Figure 6.2: Average temperature and rainfall for Impofu West (The World Bank Climate Change Knowledge Portal, 2018*)*

In terms of wind direction, the wind rose for Oyster Bay (approximately 12 km away from the south-eastern extent of the site), shows how wind speed and direction in the area are distributed throughout the year. Figure 6.3 illustrates the dominant wind direction is from the west, with the contribution of the highest wind speeds from the west-north-west and to a lesser extent from the south.

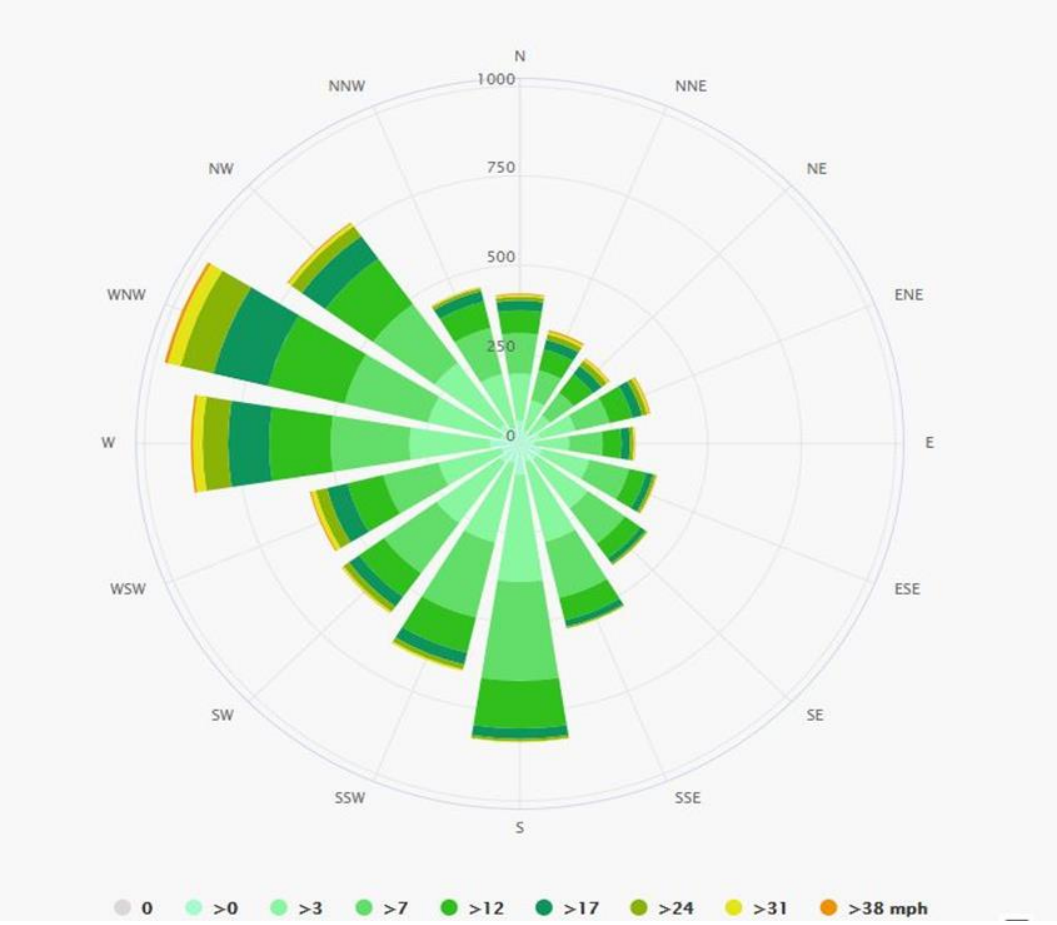


Figure 6.3: Wind rose for Oyster Bay (Enviroware, 2018)

6.2 Topography, geology and soils

The topography of the site is mostly flat and is mapped as having a slope of less than 5% but may be greater in a few isolated spots. The site terrain is located on coastal plains at altitudes between 180 and 250 m above sea level.

The underlying geology of the area as described by Lanz (2019) is characterised by Quarzitic Table Mountain Group sandstone with some influence of feldspathic sandstone and subordinate shale of the Table Mountain Group with shale and sandstone of the Bokkeveld Group (refer to Table 6.1).

The field soil investigation identified predominantly deep to moderately deep, very sandy soils with some drainage limitations. The soils of the study area have limited internal drainage in that saturation occurs within the soil profile for extended periods during the wet season (Soil Classification Working Group, 1991). According to DAFF (2002), the Impofu West site falls within three dominant land types, mainly Ha47, Bb75 and Ca80 land types. Soils of these land types comprise Constantia, Fernwood (Fw), Wasbank (Wa), Longlands (Lo), Houwhoek, Witfontein (Wf), Pinegrove (Pg), Kroonstad (Kd), Katspruit (Ka), Westleigh (We), Glencoe (Gc), Lamotte (Lt) and Clovelly soil forms. Refer to Figure 6.4 for a map of the land types on the site.

Table 6.1: Geological formations within the study area (DAFF, 2002)

Group	Formation	Lithology
Table Mountain Group	Sandstone	Grained quarzitic sands
Table Mountain Group	Subordinate shale	Feldspathic sands
Bokkeveld Group	Shale Sandstone	quartzites

The topography, geology and soils on site are of relevance to the agricultural potential of the site and the potential for palaeontological finds at the site. These specialist studies have been undertaken which will directly inform the design and turbine layout, thereby providing mitigation measures for any potential impacts where necessary. This is further discussed in Section 6.7 and Section 6.9, respectively.

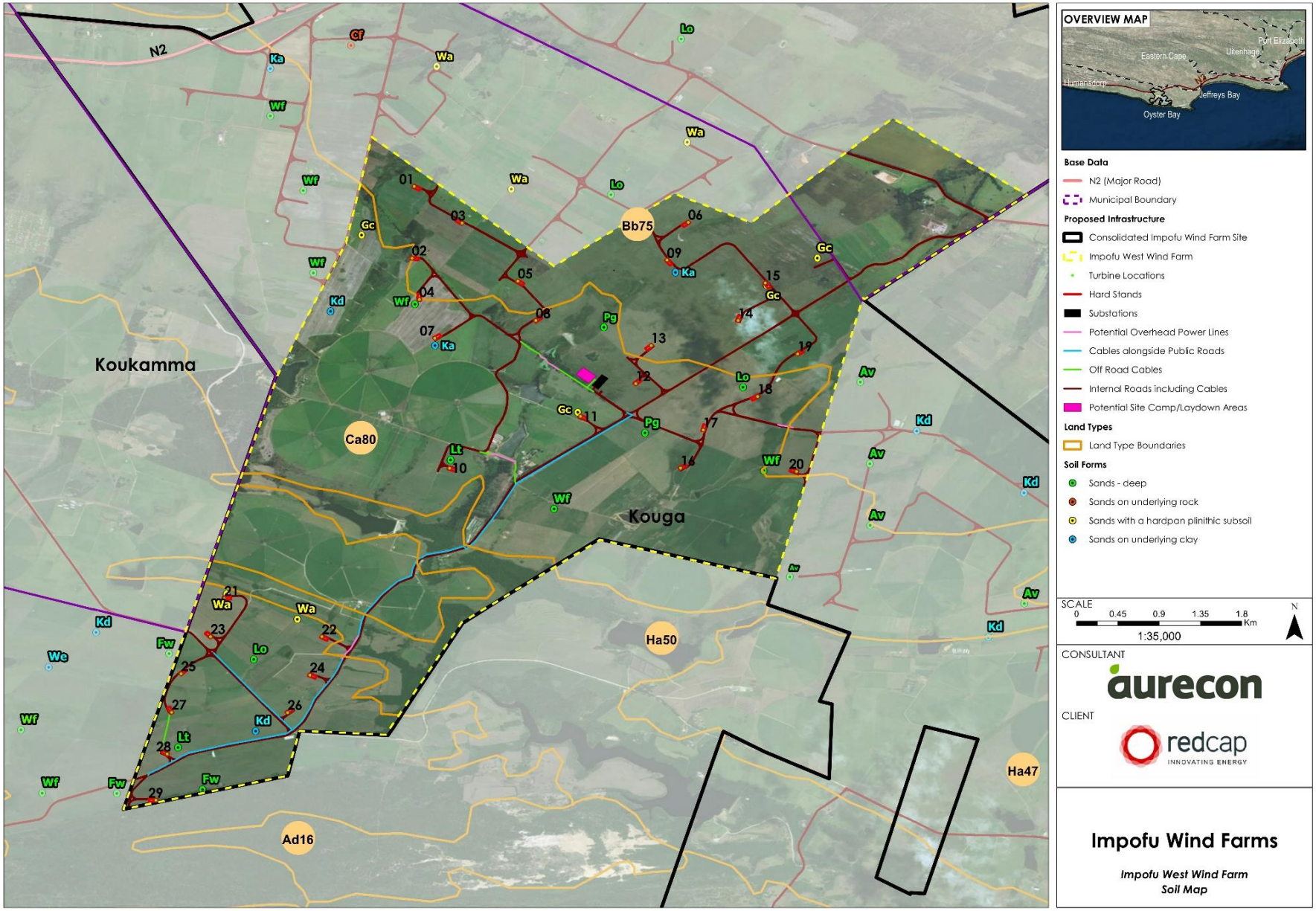


Figure 6.4: Land types and soil forms on the Impofu West site

6.3 Terrestrial ecology

Terrestrial ecology includes the floral and faunal components of the environment. Bats (refer to Section 6.5) and avifauna (birds) (refer to Section 6.6) have been excluded from this section and are dealt with separately due to the direct impacts experienced by the Wind Farm. Aquatic ecology has also been considered separately in Section 6.4.

The information included in this section is drawn from the Terrestrial Ecology Specialist Report attached as Appendix E1, undertaken by Mr. Simon Todd from Three Foxes Biodiversity Solutions (Todd, 2019).

6.3.1 Baseline description

6.3.1.1 Flora

According to the National Vegetation Map (Mucina and Rutherford, 2016) the majority of the site associated with the proposed Impofu West Wind Farm comprises mostly of Tsitsikamma Sandstone Fynbos with Southern Cape Dune Fynbos in the southern extent of the site (Figure 6.5). The terrestrial ecologist also identified small patches of Southern Afrotemperate Forest in kloofs and other sheltered positions of the site. Some narrow bands of Eastern Coastal Shale Band Vegetation and Garden Route Shale Fynbos is indicated by the National Vegetation Map to traverse the site. However, according to the terrestrial ecologist no intact portions of Eastern Coastal Shale Band Vegetation or Garden Route Shale Fynbos remains within the site as it appears to have been lost through agricultural transformation.

On a finer scale Vlok *et al*. (2008), as part of the Garden Route Initiative, indicates greater detail in terms of the mapping of the riparian vegetation and forest along the drainage lines of the broader area. In this regard, the site comprises of Kouga Mesic Proteoid Fynbos in the far north and Oyster Bay Thicket-Grassy Fynbos across the majority of the section of the site that represents plant communities of the greater Tsitsikamma Sandstone Fynbos vegetation unit (Figure 6.6).

Although the map by Vlok *et al.* (2008) provides greater detail than the National Vegetation Map, the current National List of Threatened Ecosystems relies largely on the aforementioned map and as such is the current underlying source of the legislation around threatened ecosystems. According to the National List of Threatened Ecosystems the following ecosystem status has been assigned to the vegetation units on the site:

- *Tsitsikamma Sandstone Fynbos*: Least Concern (LC). Relatively well conserved in the Garden Route National Park.
- *Southern Cape Dune Fynbos:* LC[7]. Significant proportion of the Western Cape part of this unit is conserved within the Goukamma Nature Reserve and in the Eastern Cape within the Huisklip Nature Reserve. This unit is also partly conserved within Thyspunt, Rebelsrus and Klasies River Cave.
- *Southern Afrotemperate Forest:* LC. Many areas are conserved within the Garden Route National Park, Wilderness National Park and a variety of other protected forest areas.

[7] The STEP Programme identifies the affected area as consisting of the St Francis Dune Thicket habitat type which is listed as *Endangered* in terms of ecosystem status.

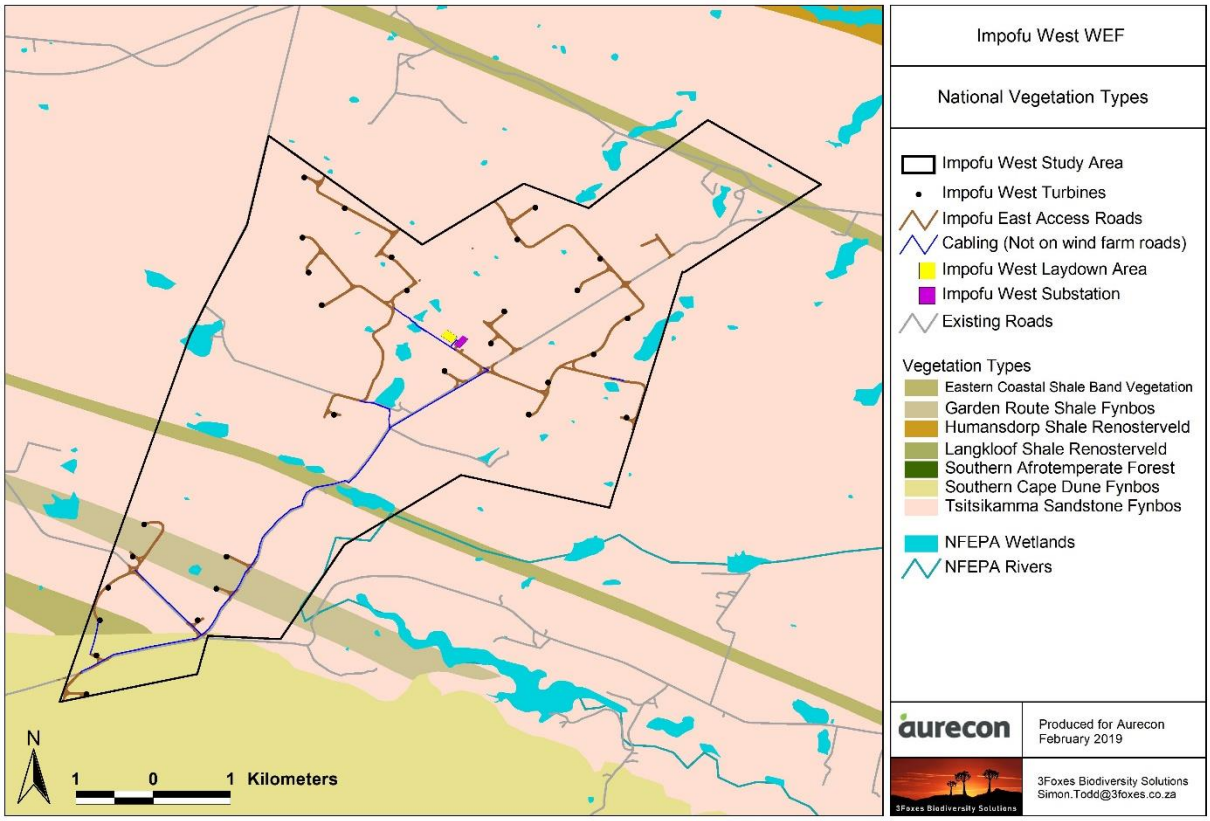


Figure 6.5: Vegetation map (Mucina and Rutherford 2006 and 2012 Powrie Update) of the Impofu West Wind Farm and surrounding area

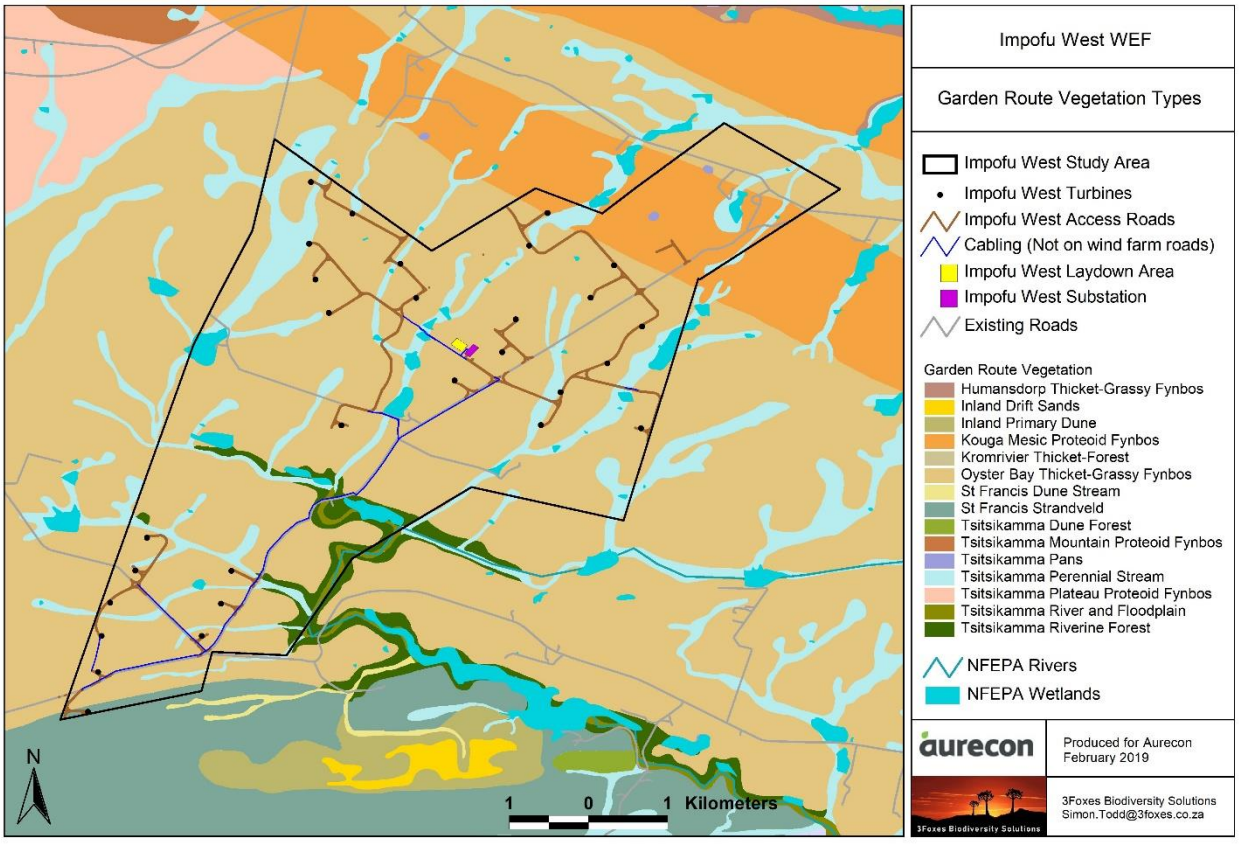


Figure 6.6: Extract of the vegetation map by Vlok *et al*. 2008 for the Garden Route Initiative

Although the National Vegetation Map provides a broad overview of the vegetation of the area in which the site is located, the map is not very informative or descriptive from a site-specific perspective. During his site inspection the terrestrial ecologist recognised a number of different plant units not mapped on the National Vegetation Map. A summary of the units identified on site and their ecological state is provided below.

Southern Cape Dune Fynbos

The southwestern margin of the Impofu West site consists of intact Southern Cape Dune Fynbos (Figure 6.7). 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 (refer to Figure 6.14) and are not considered suitable for development and have thus been excluded from the developable area. However, there are also some areas that have been degraded around the margins of the intact area which are considered to be in a moderate to poor condition and are considered medium sensitivity where some development is considered acceptable.

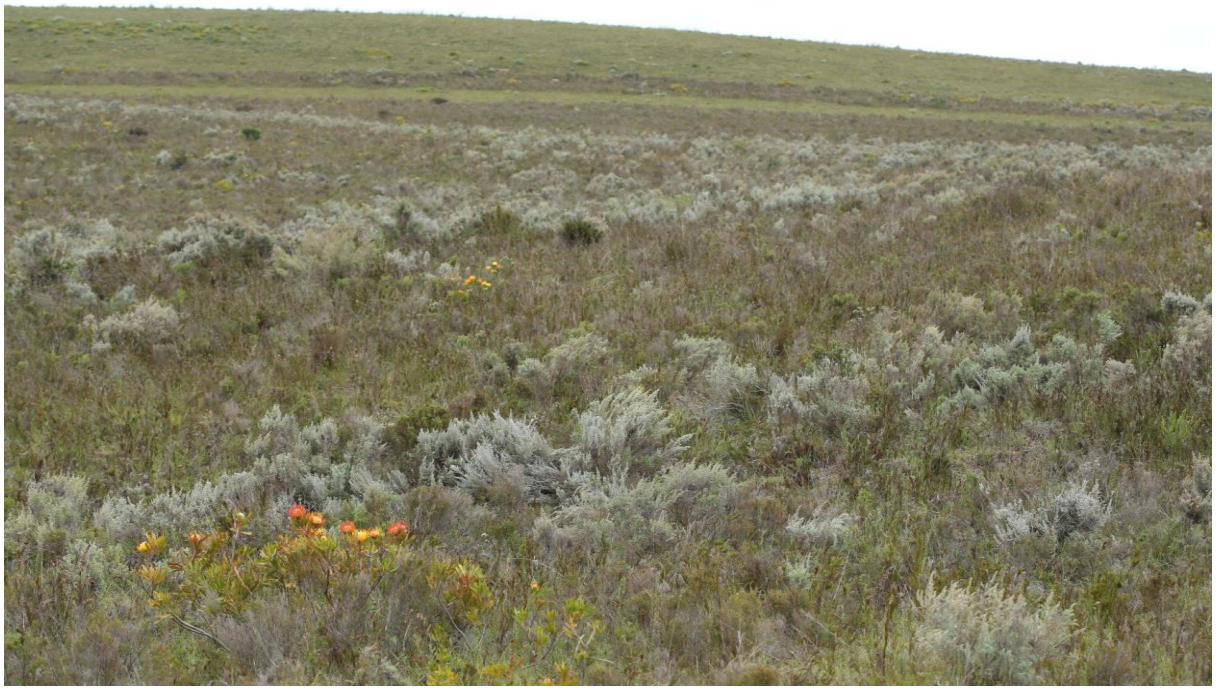


Figure 6.7: Showing one of the more disturbed areas of Southern Cape Dune Fynbos. The picture shows a high abundance of disturbance indicators such as *Stoebe plumose*

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 agricultural activities 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 6.8 and Figure 6.9). Species diversity of the degraded areas have dramatically been reduced through poor management. Alien plants as well as a high abundance of species indicating disturbance is present at these areas and are generally considered as medium sensitive. Wetlands located within these areas are still considered to be of high sensitivity. The degraded areas still play a role in terms of providing habitat for fauna and ecological functioning and although there are some turbines in these areas, this would not compromise overall ecological functioning and habitat value.

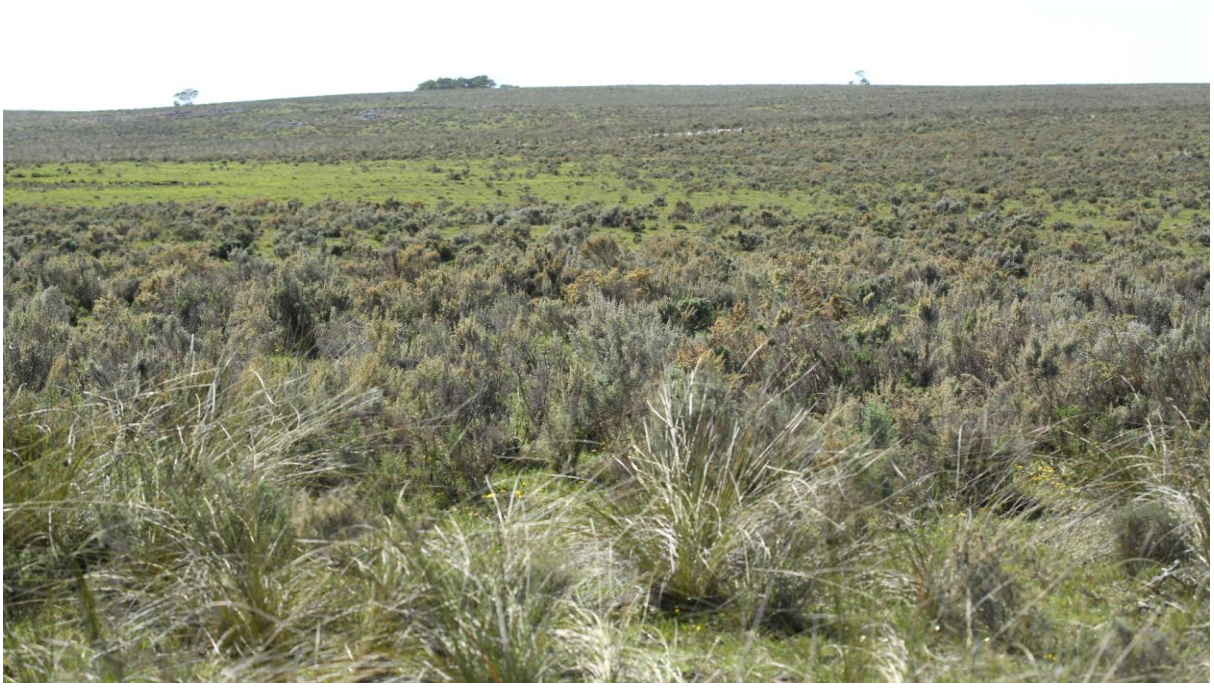


Figure 6.8: Highly degraded (grazing pressure and previously transformed) Tsitsikamma Sandstone Fynbos in the north of the Impofu West study area

Figure 6.9: Degraded remnant of Tsitsikamma Sandstone Fynbos located within croplands

Croplands, Pastures and Transformed Areas

A significant portion of the site comprises of croplands, pastures and previously ploughed areas used for livestock grazing (Figure 6.10). In general, these areas are of low value in terms of fauna and flora and not considered to be sensitive from an ecological perspective. The cropland areas and fields are used by some fauna for foraging but the significance of this remains low. Apart from the planted pasture species, common weedy and alien species present on the old pasture lands include *Pennisetum clandestinum*, *Eragrostis curvula*, *Plantago lanceolata*, *Cynodon dactylon*, *Conyza bonariensis*, *Seriphium plumosum* and *Pteridium aquilinum*.

Figure 6.10: The majority of the northern section of the Impofu West site has been transformed for croplands

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 6.11). These forest patches are often small and fragmented within croplands however they remain important habitat for a variety of fauna including the Blue Duiker *Philantomba monticola* which has been confirmed present on site. The forest patches have been classified as No-Go areas and as such excluded from the development footprint. However, some existing roads that would be used to access the site traverse through the forested areas and may need to be upgraded to facilitate movement of construction vehicles. The ecologist investigated these areas in the field and found no significant loss of intact forest habitat would occur in these areas.

Figure 6.11: 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

6.3.1.2 Fauna

Due to the transformed nature of the majority of the site, fewer mammals occur than would have naturally. According to the ecologist the site likely contains 50 naturally occurring mammals, however given the transformed nature of the site this number is likely to be significantly lower. The following species recorded or known to occur in the area are of conservation concern: African Striped Weasel *Poecilogale albinucha* (NT), Leopard *Panthera pardus* (VU), Cape Clawless Otter *Aonyx capensis* (NT), Mountain Reedbuck *Redunca fulvorufula* (Endangered) and Blue Duiker *Philantomba monticola* (VU). Blue Duiker occur in the forest patches (confirmed through camera traps) and it possible that Leopard may occur occasionally (not confirmed through camera traps). The Striped Weasel is confirmed present at the site, based on the camera trapping but as only a single capture event occurred, this suggests that is not common in the area and occurs at a low density. Mountain Reedbuck was recorded within the intact Fynbos within the Impofu North site and is not likely to occur within the Impofu West site 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. Significant habitat for mammals (e.g. forest patches, dunes and wetlands) have been avoided in the development footprint (Figure 6.12).

The site for the Impofu West Wind Farm has not been well sampled in the past for reptile biodiversity. Species known to occur (not observed as part of the ecological study) in the area that are of conservation importance include: Elandsberg Dwarf Chameleon *Bradypodion taeniabronchum* (EN), FitzSimons' Long-tailed Seps *Tetradactylus fitzsimonsi* (VU), and Karoo Padloper *Chersobius boulengeri* (NT). Intact Dune Fynbos in the south of the site, riparian areas, forest and thicket patches are the most suitable and important habitat for reptiles. These areas have been avoided in the proposed development footprint (Figure 6.12).

There are numerous earth dams, wetlands and drainage lines present at the site which represent the most important habitats for amphibians. Species observed at the site include Cape River Frog *Xenopus laevis*, Common Caco *Cacosternum boettgeri*, Bronze Caco *Cacosternum nanum* and Raucous Toad *Sclerophrys capensis*. Depressions and other wet features on the site can also provide habitat for less water dependent species like Cacos and Toads (Figure 6.12). These features have been well buffered in the proposed development footprint.

Important habitats for mammals at the site generally include the drainage lines and wetlands which occur across the site, the isolated forest patches and large rocky outcrops within the fynbos in the north of the site. 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 direct impact on mammals is therefore considered unlikely and no species would be disproportionately impacted by the development.

Figure 6.12: Examples of fauna found at the site, from left to right: Woodland Dormouse, Cross-Marked Grass Snake and Common Caco

6.3.1.3 Critical Biodiversity Areas

A large intact section (dune system that has been identified as a No-Go zone) in the southwest of the site is classified as CBA, whilst there are also numerous fragmented CBAs across the site (Figure 6.13). Several proposed turbine locations appear to be situated within these CBAs, however the ecologist confirmed via site visits (September 2017 and March 2018) that the majority of the areas, where turbines are located in CBAs, have undergone significant land-use changes since the CBA layers were created and these areas are now transformed. The underlying reasons for classifying these areas as CBA has been lost through transformation (agriculture) and they no longer carry significant biodiversity. The current layout was designed using an impact avoidance strategy and as a result sensitive and/or intact CBAs have been avoided to ensure a low impact.

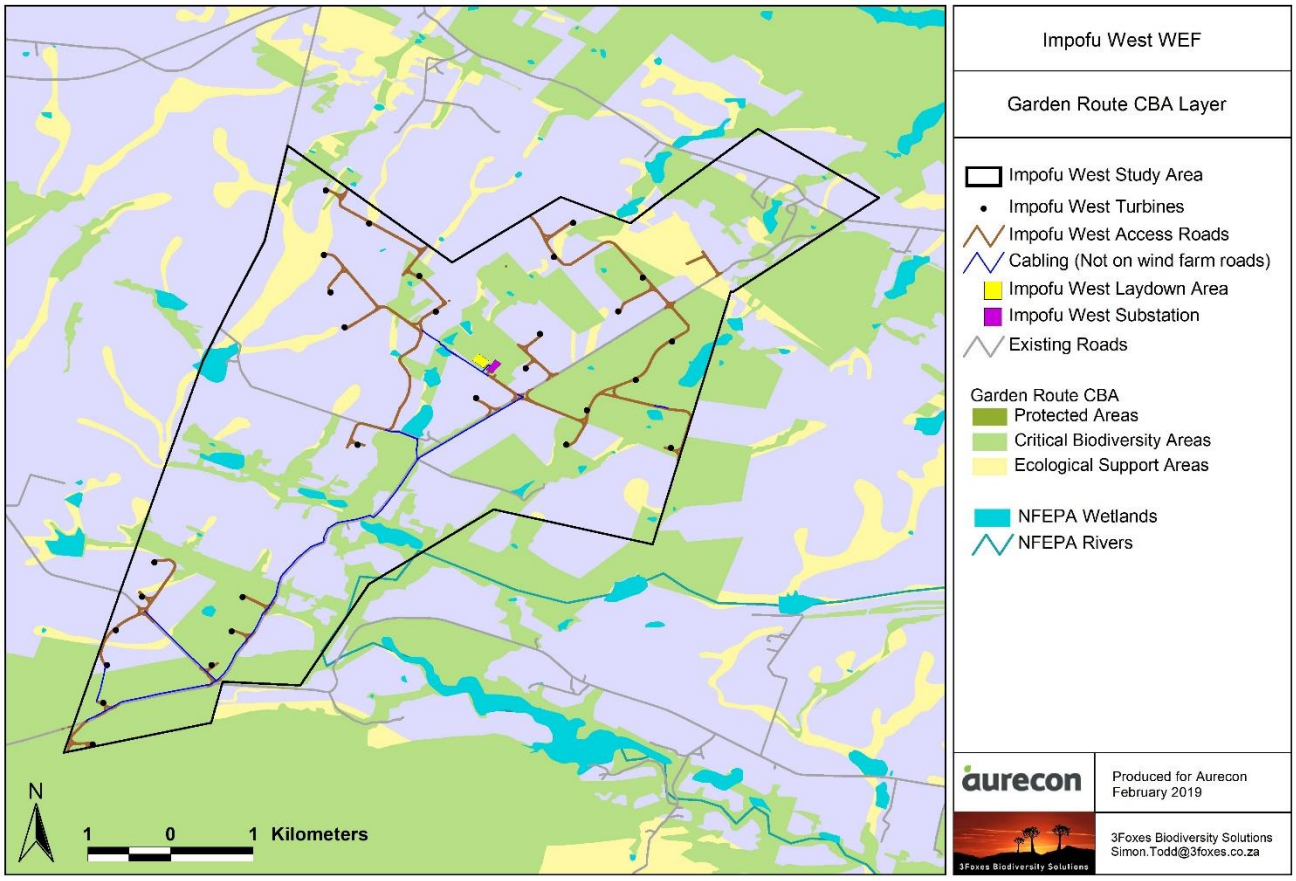


Figure 6.13: Critical Biodiversity Areas map for the Impofu West study area, showing the extensively transformed nature of the site apart from the intact dune area in the south

6.3.2 Site sensitivity

A sensitivity map that considers the ecological features of the site was developed (Figure 6.14). 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. The proposed access roads that do traverse these features are only along existing road alignments or through degraded areas and these have all been verified in the field as acceptable. This includes the proposed upgrades to two river crossings along the District Road 1774, which the ecologist has checked and verified. The proposed upgrades at these locations would not generate significant impact to the terrestrial environment. Additional mitigation to limit impact on freshwater systems from these activities is recommended in Section 6.4.

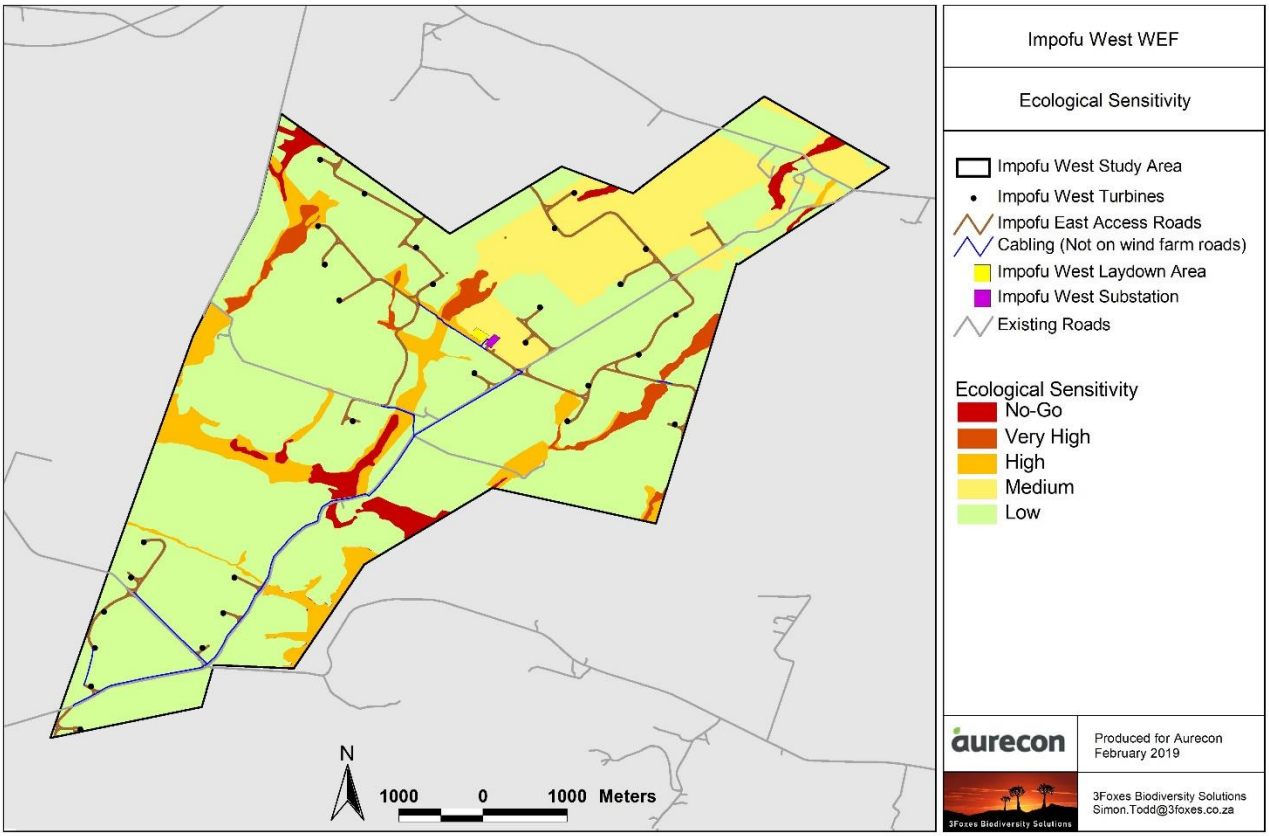


Figure 6.14: Sensitivity map of the Impofu West Wind Farm

6.3.3 Impact assessment with mitigation

Several ecological impacts, on fauna and flora, have been identified by the ecological specialist and are largely associated with the loss of currently intact ecological habitat and the transformation of these areas. It is conservatively estimated by the ecologist that less than 5 ha of the Tsitsikamma Sandstone Fynbos vegetation type will be lost as a result of the proposed wind farm, while the extent of habitat loss within the Southern Cape Dune Fynbos is estimated at less than 5 ha. The remaining footprint is located in previously disturbed land or agricultural land and not considered to have a significant value for most terrestrial biodiversity. The impacts of the proposed wind farm in terms of direct habitat loss and ecological patterns and processes are anticipated to be low.

Given that the current layout has been designed using an 'impact avoidance' strategy, it is anticipated that no fauna or flora on the site would be particularly impacted or vulnerable to the proposed wind farm. Mitigation measures proposed are additional to the avoidance strategy and will further reduce the likely impacts identified.

The following tables consider the potential impacts on terrestrial ecology of the site and consider the major risk factors as well as contributing activities associated with the proposed development. These have been identified as:

- Construction impacts on vegetation and plant SCC;
- Direct and indirect faunal impacts during construction;
- Operational impacts on fauna;
- Impacts on CBAs during operation;
- Alien plant invasion following decommissioning; and
- Faunal Impacts during decommissioning.

Table 6.2: Construction impacts: loss of vegetation and plant SCC

Phase	Construction	
Impact description	The abundance of species of conservation concern (SCC) across the site is relatively low and therefore there is not a significant risk to the local populations of such species. 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.	
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Duration	Permanent	Permanent
Extent	Local	Local
Intensity	Low	Low
Significance	**MODERATE (-)**	**MINOR (-)**
Probability	Almost certain / Highly Probable	Likely
Confidence	High	High
Reversibility	Low	Low
Resource irreplaceability	Medium	Low
Mitigation measures		
• Pre-construction 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. • Minimise the development footprint as far as possible and rehabilitate disturbed areas after construction.		

Table 6.3: Construction impact: direct and indirect impacts to fauna

Phase	Construction	
Impact description	Construction of the proposed wind farm will result in a loss of habitat and impact both directly (destroyed or poaching) and indirectly (noise and disturbance) on fauna e.g. slow-moving reptiles or retiring species would likely not be able to escape construction. The presence of machinery and personnel during construction and operation may result in this impact.	
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Duration	Short term	Short term
Extent	Local	Local
Intensity	Moderate	Moderate
Significance	**MINOR (-)**	**MINOR (-)**
Probability	Almost certain / Highly Probable	Likely
Confidence	High	High
Reversibility	Medium	High
Resource irreplaceability	Low	Low

Mitigation measures
• Search and rescue for reptiles and other vulnerable species before areas of intact vegetation are cleared. • Limit access to the site and ensure that construction staff and machinery remain within the demarcated construction areas during the construction phase. • Environmental induction for all staff and contractors on site.

Table 6.4: Operational impact: disturbance of fauna

Phase			Operational	
Impact description	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.			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	On-going		On-going	
Extent	Local		Limited	
Intensity	Moderate		Low	
Significance	**MODERATE (-)**		**MINOR (-)**	
Probability	Almost certain / Highly probable		Likely	
Confidence	High		High	
Reversibility	Medium		High	
Resource irreplaceability	Low		Low	
Mitigation measures				
• 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. • Limit access to the site to staff and contractors only. • Appropriate design of roads and other infrastructure to minimise faunal impacts and allow fauna to pass through or underneath these features. • No electrical fencing within 20 cm of the ground as tortoises become stuck against such fences and are electrocuted.				

Table 6.5: Operation impact: impacts to Critical Biodiversity Areas

Phase			Operational	
Impact description	Some parts of the development footprint are located within areas that are classified as Critical Biodiversity Area (CBAs) and Ecological Support Areas (ESAs). 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.	
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Duration	Permanent	On-going
Extent	Local	Local
Intensity	Moderate	Very Low
Significance	**MODERATE (-)**	**MINOR (+)**
Probability	Certain/ Definite	Likely
Confidence	High	High
Reversibility	Low	Medium
Resource irreplaceability	Medium	Low
Mitigation measures		
• 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. • Alien clearing and continued management in and around those parts of the development footprint that are within natural to near-natural vegetation to improve habitat quality of these areas and limit further degradation of the site from alien invasion.		

Table 6.6: Decommissioning impact: alien plant invasion following decommissioning

Phase				**Decommissioning**
Impact description	Decommissioning will result in significance disturbance at the site which will encourage alien plant invasion. There are already numerous problem species present at the site and these will quickly establish and dominate disturbed areas. Problem species present at the site include A*cacia 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.			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	Long Term		Medium Term	
Extent	Local		Local	
Intensity	Moderate		Low	
Significance	**MINOR (-)**		**MINOR (-)**	
Probability	Almost certain/Highly Probable		Probable	
Confidence	High		High	
Reversibility	Medium		Low	
Resource irreplaceability	Low		Low	

Mitigation measures
• 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 five years after decommissioning. • Regular monitoring of alien plants within the disturbed areas for at least two years after decommissioning or until alien invasive plants are no longer a problem at the site. • Regular alien clearing should be conducted using best practice methods for species concerned.

Table 6.7: Decommissioning impact: faunal impacts due to decommissioning

Phase				Decommissioning
Impact description	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.			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term		Short term	
Extent	Local		Local	
Intensity	Moderate		Low	
Significance	**MINOR (-)**		**MINOR (-)**	
Probability	Almost certain/ Highly probable		Probable	
Confidence	High		High	
Reversibility	High		High	
Resource irreplaceability	Medium		Low	
Mitigation measures				
• Any potentially dangerous fauna such as snakes threatened by the decommissioning activities should be removed to a safe location prior to commencement of decommissioning activities. • All hazardous material should be stored in the appropriate manner to prevent contamination of the site. All 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. • All vehicles accessing the site should adhere to low speed limits (40 km/h max) to avoid collision with susceptible species such as snakes and tortoises. • No excavated holes or trenches should be left open for extended periods as fauna may fall in and become trapped. • Above-ground infrastructure should be removed from 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.				

6.3.4 No-Go alternative

The No-Go alternative anticipates the current land use at the proposed site would continue and the project would not go ahead and current trends in land-use will likely continue. This includes a continued transformation of intact vegetation to pastures or croplands or further degradation because of alien plant infestation and poor fire and grazing management. 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.

6.3.5 Conclusion and recommendations

The proposed wind farm has been located in an agricultural area where high levels of transformation have already occurred. Remaining intact vegetation has been avoided as far as possible in the design of the layout and impacted areas are largely already degraded. There are no negative terrestrial ecology impacts associated with the project that cannot be mitigated to be of minor significance. 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 project on the local environment can be reduced to a low and acceptable magnitude, of minor significance. Furthermore, positive biodiversity outcomes are likely to be realised through a contribution to the development to the Greater Kromme Stewardship Initiative, as well as, improved management of intact habitat in the areas surrounding the development footprint. As such, there are no fatal flaws associated with the development and no terrestrial ecological considerations that should prevent it from proceeding.

6.4 Aquatic ecology

The information included in this section is drawn from the Aquatic Ecology Specialist Report attached as Appendix E2, undertaken by Dr. Brian Colloty of Sherman Colloty and Associates (Colloty, 2019).

6.4.1 Baseline description

The project falls within the K80E (Tsitsikamma River), K80F (Klipdrift River) and K90D (Kromme River) quaternary catchments within the South Eastern Coastal Belt Ecoregion located within the Mzimvubu-Tsitsikamma Water Management Area (WMA7).

Aquatic features on the site have been identified based on field work and monitoring activities undertaken by Colloty (2019) as well as a number of other sources including; the National Freshwater Ecosystem Priority Areas (NFEPA) project wetland mapping; best practice methods developed in conjunction with other wetland and aquatic specialists and the Department of Water and Sanitation (DWS) and assessment criteria contained in the DWAF (2005/2007) delineation manuals and the Wetland Classification System.

These aquatic features are described below and mapped in Figure 6.15 and Figure 6.16. The site is characterised by perennial, non-perennial watercourses and drainage lines associated with the Tsitsikamma River, Klipdrift River and Kromme River. These watercourses do not have clearly defined beds or banks and only carries water during or immediately after periods of heavy rainfall. There has been high degree of transformation that has taken place within the catchments of these systems through to conversion of the natural fynbos to pasture for agricultural purposes, which includes clearance of natural vegetation, for grazing, livestock trampling, a large number of farm dams and alien tree infestation (*Acacia* species).

According to the NFEPA wetland data and the National Wetland Inventory Data, several wetland types occur within the study area. These wetlands are classified as valley bottom wetlands, both channelled and unchanneled, endorheic pans, depressions and artificial to man-made systems such as dams, reservoirs and irrigation balancing dams. Goods and services provided by wetlands on site include maintenance of biodiversity and water supply for irrigation. The wetlands on site are considered by Colloty (2019) to be modified, with either small or narrow riparian zones, or associated with Valley Bottom (Channelled or Unchannelled) wetlands. This can be attributed to the agricultural activities and irrigation that dominates the site.

Aquatic plant species within this region are limited to a small number of grass, sedge and restio species, while riverine forests, contained very few riparian obligates due to the high levels of alien plants. Several terrestrial species that are protected were found in the river valleys, which included Milkwoods (*Sideroxylon inerme* – National Forestry Act) and Aloes (PNCO).

6.4.2 Site sensitivity

According to Colloty (2019), the Present Ecological State of a river or wetland represents the extent to which it has changed from the reference or near pristine condition (Category A) towards a highly impacted system where there has been an extensive loss of natural habit and biota, as well as ecosystem functioning (Category E). The PES system also incorporates EI (Ecological Importance) and ES (Ecological Sensitivity) separately. The PES for has been established for the catchments as well as the water crossings which has through the application of accepted methodologies.

The PES for the drainage lines and the rivers in the study area were rated as follows (DWS, 2014 – where D = Largely Modified and C = Moderately Modified):

Table 6.8: PES for the Impofu West Wind Farm

Sub-quaternary catchment number	Present Ecological State	Ecological importance	Ecological sensitivity
9127	D	Moderate	Medium
9201	D	Medium	High
9152	C	High	High

It is thus evident that the study area systems are largely functional but are impacted upon as a result of current land use practices as described in Section 6.4.1.

This was confirmed for each of the affected reaches located within the development footprint and in particular the areas that would be crossed by the proposed road layout shown in Figure 6.16 and Figure 6.17 (five new river crossings plus two on the DR01774), which range between D and C/D. In other words, the systems observed are modified, with either small or narrow riparian zones, or associated with Valley Bottom (Channelled or Unchannelled) wetlands.

Based on the aquatic ecology study, it is evident that the aquatic systems within the study area are largely functional but are impacted upon due to the current agricultural land use practices.

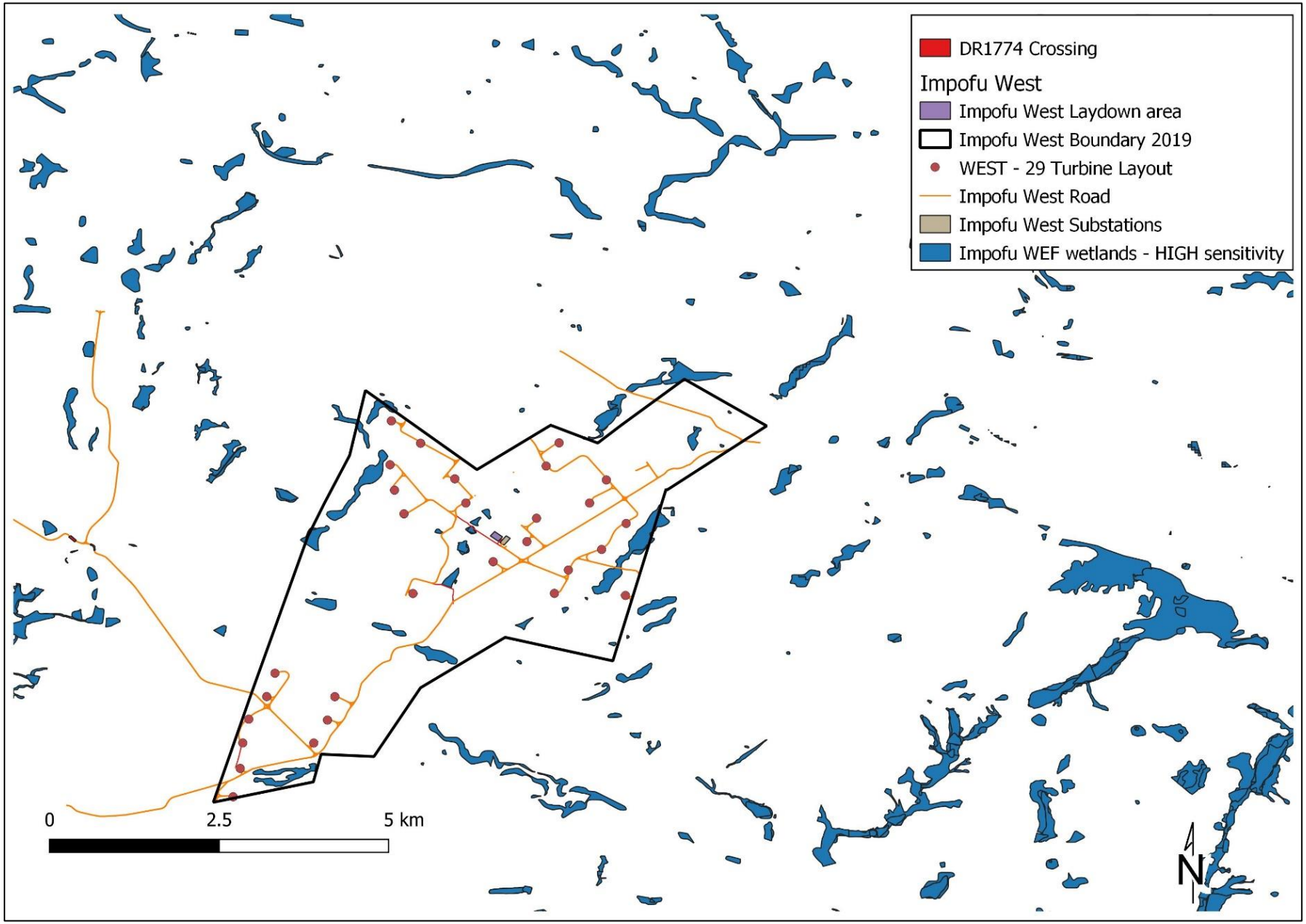


Figure 6.15: The final delineated natural wetland map for the site

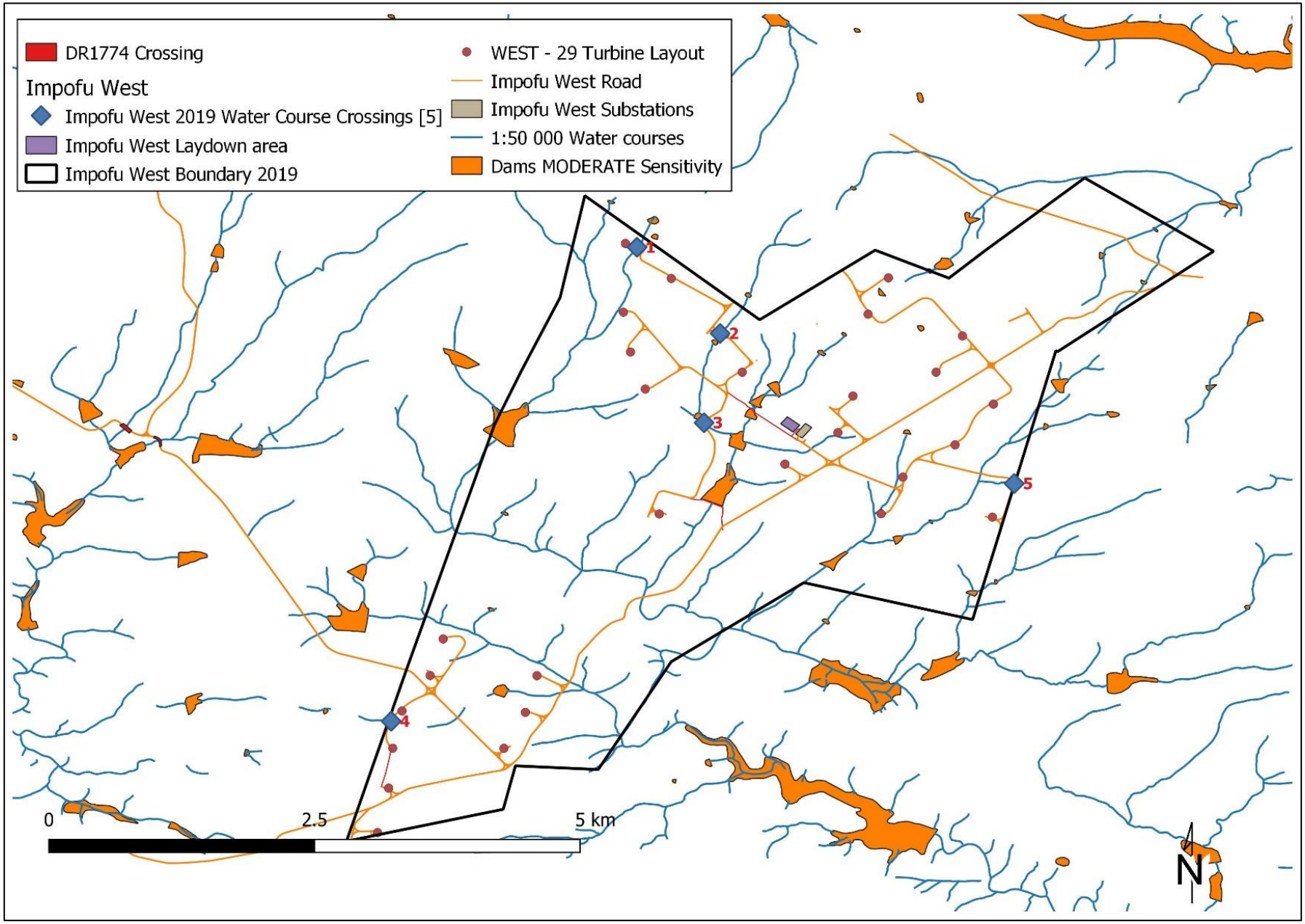


Figure 6.16: 1:50,000 water courses and dams known for the site with five river crossings indicated by blue diamonds

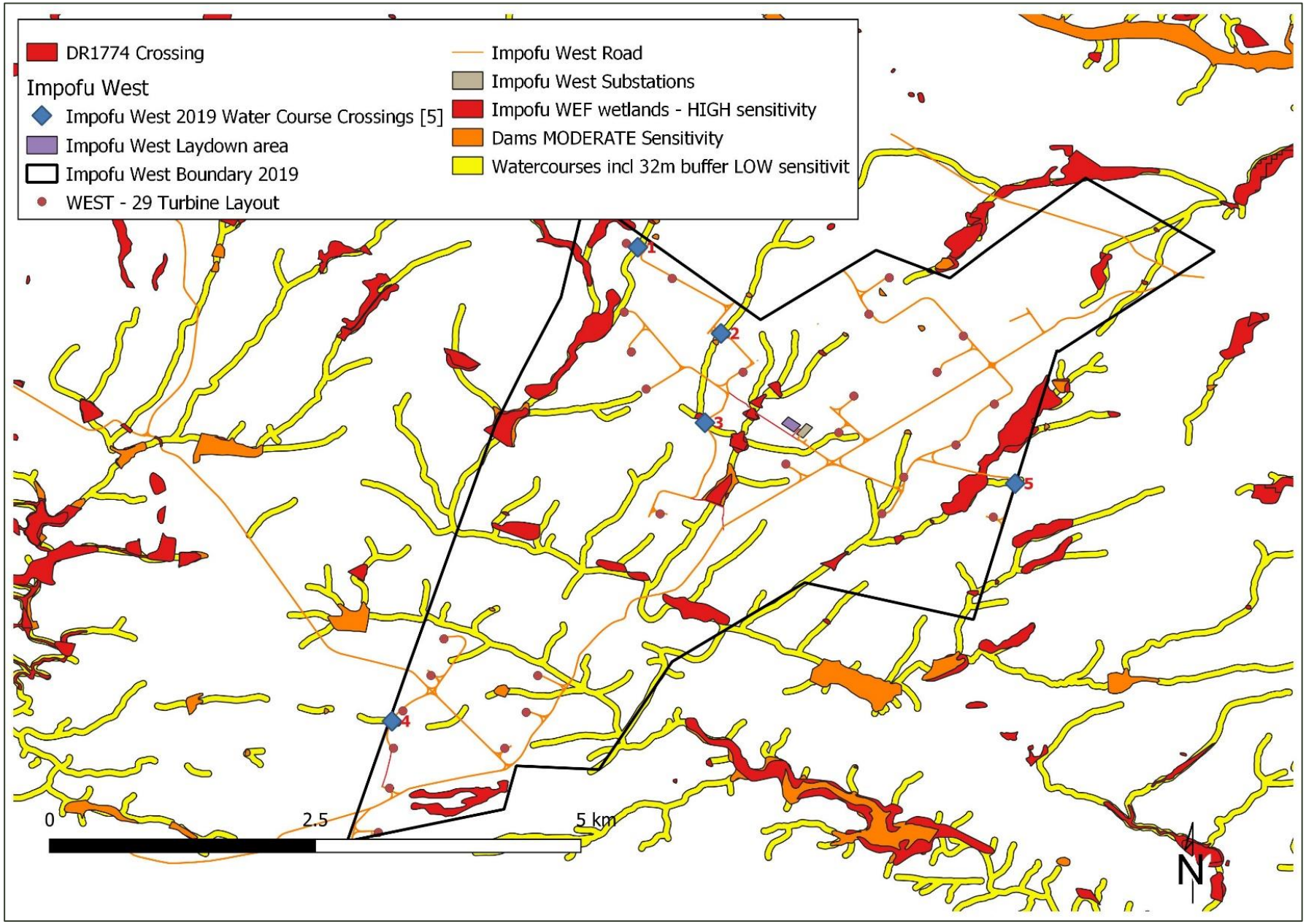


Figure 6.17: Aquatic sensitivity map for the Impofu West Wind Farm site, with the five crossings indicated with blue triangles plus the two on DR01774

6.4.3 Impact assessment with mitigation

The predicted aquatic ecology impacts that could potentially result from the proposed construction and operation of the proposed Impofu West Wind Farm and associated infrastructure are specifically in relation to the loss of aquatic species of concern and the loss of natural wetlands.

The following tables consider the potential impacts on aquatic ecology which have been summarised as:

- During construction and decommissioning vegetation near or within watercourses will be distributed which may contain species of special concern;
- Construction could result in the loss of wetland with high sensitivity within the site and/or any required access road upgrades (e.g. DR01774);
- Loss of riparian systems and watercourses during construction and decommissioning within the site and/or any required access road upgrades (e.g. DR01774);
- During construction, contamination of watercourses due to waste generation and accidental spill of materials stored and handled with impacts on water quality; and
- Impact on aquatic systems through possible increase in surface water runoff- during operation, with potential for downstream erosion and sedimentation.

Table 6.9: Construction and decommissioning impacts: loss of aquatic species of special concern

Phase		**Construction**		**Decommissioning**
Impact description	During construction and decommissioning vegetation near or within watercourses will be disturbed which may contain species of special concern. However due to the state of the current systems, and the proposed localities of the river crossing and road upgrades inclusive of the proposed crossing upgrades on DR 1774, this impact is unlikely due to the lack of any such species within the proposed alignments. It should be noted that a number of PNCO / NFA species do occur and the appropriate permits from DEDEAT and DAFF must be obtained prior to disturbing this plants / trees. Species included *Eulophia* (orchids), *Sideroxylon inerme* (Milkwoods)			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	Medium Term		Short Term	
Extent	Limited		Limited	
Intensity	Low		Very Low	
Significance	**MINOR (-)**		**NEGLIGIBLE (-)**	
Probability	Probable		Unlikely	
Confidence	High		High	
Reversibility	High		High	
Resource irreplaceability	Low		Low	
Mitigation measures				
• A final pre-construction walkdown should be conducted, as part of a Plant Search and Rescue plan, with the appropriate permits in place. • All alien plant re-growth, which is currently high within the greater region must be monitored and should it occur, these plants should be eradicated within the project footprint and especially in areas near the proposed crossings. The scale of the operation does however, not warrant the use of a Landscape Architect and / or Landscape Contractor. • Where any road crossings will be upgraded, construction should take cognisance of the following:				

- All pipe culverts must be removed and replaced with suitably sized box culverts, where road levels are raised.
- River levels, regardless of the current state of the river / watercourse will be reinstated thus preventing any impoundments from being formed.
- Approach road embankments especially where large cut and fill areas will be required must be rehabilitated during the construction process, to minimise erosion.
- Suitable stormwater management systems must be installed and monitored during the first few months of use. Any erosion / sedimentation must be prevented.
- If any of the delineated wetlands occur within 50 m of the existing crossings, then a detailed monitoring plan must be developed.

- Obtain appropriate permits from DEDEAT and DAFF prior to disturbing/removing any protected plants.

Table 6.10: Construction impact: loss of remaining wetlands with high sensitivity

Phase		**Construction**		
Impact description	The construction of the project, could potentially result in the loss of high sensitivity of functional wetlands and riparian systems and watercourses that provide ecosystem services within the site and/or any required access road upgrades (eg. DR01774).			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	Short Term		Brief	
Extent	Local		Limited	
Intensity	Moderate		Very low	
Significance	**MINOR (-)**		**NEGLIGIBLE (-)**	
Probability	Probable		Unlikely	
Confidence	High		High	
Reversibility	High		High	
Resource irreplaceability	Medium		Low	
Mitigation measures				

- Conduct a post-authorisation site walkdown to assist in developing a stormwater management plan, and wetland rehabilitation and monitoring plan.
- All alien plant re-growth, which is currently high within the greater region must be monitored and should it occur, these plants should be eradicated within the project footprint and especially in areas near the proposed crossings.
- Where any road crossings will be upgraded, construction should take cognisance of the following:
  - All pipe culverts must be removed and replaced with suitably sized box culverts, while also reducing the height of the bridge footings (culvert bases)
  - River levels, regardless of the current state of the river / water course will be reinstated thus preventing any impoundments from being formed.
  - Approach road embankments especially where large cut and fill areas will be required must be rehabilitated during the construction process, to minimise erosion.
  - Suitable stormwater management systems must be installed and monitored during the first few months of use. Any erosion / sedimentation must be prevented.
  - If any of the delineated wetlands occur within 50 m of the existing crossings, then a detailed monitoring plan must be developed.

Table 6.11: Construction and decommissioning impact: loss of riparian systems and watercourses

Phase	Construction	Decommissioning
Impact description	Construction and decommissioning could result in the loss of riparian systems that are still functional and provide an ecosystem service within the site and for any required access road upgrades (e.g. DR01774). This would also include any of the underground cables not associated with any roads although no aquatic habitat remains or is associated with these cable alignments.	
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Duration	Medium Term	Short Term
Extent	Limited	Very Limited
Intensity	Moderate	Very Low
Significance	**MINOR (-)**	**NEGLIGIBLE (-)**
Probability	Probable	Unlikely
Confidence	High	High
Reversibility	High	High
Resource irreplaceability	Low	Low
Mitigation measures		
• Conduct a post-authorisation site walkdown to assist in developing a stormwater management plan, and wetland rehabilitation and monitoring plan. • All alien plant re-growth, which is currently high within the greater region must be monitored and should it occur, these plants should be eradicated within the project footprint and especially in areas near the proposed crossings. • Where any road crossings will be upgraded, construction should take cognisance of the following: - All pipe culverts must be removed and replaced with suitably sized box culverts, where road levels are raised. - River levels, regardless of the current state of the river / watercourse will be reinstated thus preventing any impoundments from being formed. - Approach road embankments especially where large cut and fill areas will be required must be rehabilitated during the construction process, to minimise erosion. - Suitable stormwater management systems must be installed and monitored during the first few months of use. Any erosion / sedimentation must be prevented. - If any of the delineated wetlands occur within 50 m of the existing crossings, then a detailed monitoring plan must be developed.		

Table 6.12: Construction and decommissioning impact: impact on localised water quality

Phase	Construction	Decommissioning
Impact description	During construction and decommissioning a number of materials as well as chemicals will be required. Any spills during transport or while works is conducted within any watercourses has the potential to affect the surrounding biota.	
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Duration	Medium Term	Brief
Extent	Limited	Very Limited

Intensity	High	Very Low
Significance	**MINOR (-)**	**NEGLIGIBLE (-)**
Probability	Likely	Probable
Confidence	High	High
Reversibility	Medium	High
Resource irreplaceability	Low	Low
Mitigation measures		

- All construction materials including fuels and oil should be stored in demarcated areas that are contained within impermeable berms / bunds to avoid spread of any contamination. Washing and cleaning of equipment should also be done in berms or bunds, in order to trap any cement and prevent excessive soil erosion.
- Mechanical plant and bowsers must not be refuelled or serviced within or directly adjacent to any channel.
- All construction camps, lay down areas, batching plants or areas and any stores should be more than 50 m from any demarcated watercourses.
- Chemicals used for construction must be stored safely on site and surrounded by impermeable bunds. Chemical storage containers must be regularly inspected so that any leaks are detected early.
- Littering and contamination of water sources during construction must be prevented by effective construction camp management.
- Emergency plans must be in place in case of spillages onto road surfaces and water courses.
- No stockpiling should take place within a watercourse.
- All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds.
- Stockpiles must be located away from river channels.
- The construction camp and necessary ablution facilities meant for construction workers must be beyond the 50 m buffer described previously.

Table 6.13: Operational impact: impact on aquatic systems through increase in surface water runoff

Phase		**Operational**	
Impact description	During operation the increase in hard surface areas, and roads that require stormwater management will increase the concentration of surface water flows. These higher volume flows, with increased velocity could potentially result in downstream erosion and sedimentation.		
	Without mitigation	**With mitigation**	
Nature	Negative	Negative	
Duration	Long term	Short term	
Extent	Local	Limited	
Intensity	Moderate	Very Low	
Significance	**MINOR (-)**	**NEGLIGIBLE (-)**	
Probability	Probable	Unlikely	
Confidence	High	High	
Reversibility	Medium	High	
Resource irreplaceability	N/A	N/A	

Mitigation measures
• A stormwater management plan must be developed post environmental authorisation, detailing the structures and actions that must be installed to prevent the increase of surface water flows directly into any natural systems. This must be inspected on an annual basis to ensure that the systems are functional. • Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) and the re-vegetation of any disturbed riverbanks.

6.4.4 No-Go alternative

The No-Go alternative anticipates changes to the aquatic ecology environment that would occur in the absence of the proposed development. In this scenario, the No-Go alternative would result in the continuation of the current land use on site which is increasing in intensity within the region. The aquatic ecology investigation identified an increase in the number of irrigation pivots, or land being cleared or converted for grazing, thus continued clearing as well as other impacts such as water abstraction and changes to water quality (agricultural return flow), would be seen as a high negative impact significance in the region, as the number of wetlands would be lost, and changes to streams and rivers would increase, resulting in a deterioration of these systems over time. This is further substantiated, based on the site information collected for this project to date as well as long-term monitoring data collected for the Gibson Bay and Tsitsikamma Community Wind Farms, where wetland / water course degradation continues in the presence of the current agricultural practices and is only slowed through alien invasive tree clearing being promoted by some of the wind farms and an operator that produces charcoal from the alien *Acacias* on a large scale basis near Gibson Bay and Tsitsikamma Community Wind Farms.

6.4.5 Conclusion and recommendations

Based on the aquatic assessment undertaken thus far, the proposed facility would have a limited impact on the aquatic environment. This is because the infrastructure will avoid the delineated natural wetlands (which delineation includes a 50 m buffer applied to each wetland), with a limited number of new watercourse crossings because the layout makes use of many of the existing roads. The environmental assessment of the aquatic related impact shows minor impacts with the potential for mitigation to reduce these to low significance.

Various other mitigation measures have been included to address potential residual impacts including a walkdown to inform a stormwater management plan and wetlands rehabilitation and monitoring plan, obtaining the necessary permits for protected species, monitoring of alien plant re-growth, restoring water levels through improved culvert design, as well as various best practice measures to address erosion and contamination of watercourses from construction activities.

6.5 Bats

The information included in this section is drawn from the Bats Specialist Report attached as Appendix E3, including preliminary pre-construction bat monitoring results, undertaken by Mr Werner Marais of Animalia (Animalia, 2019).

6.5.1 Baseline description

The presence of bats in an environment is largely connected to areas providing roosting and foraging habitats. Vegetation types (described in Section 6.3), climatic and wind conditions (described in Section 0) are therefore suitable indicators for potential roosting sites. The presence of watercourses (described in Section 6.4) and certain vegetation types providing insect habitat would be indicators of potential foraging sites. Adhering to the best practice guidelines, a 12 months monitoring schedule was initiated in November 2017 by the Bat specialist. The monitoring period included seasonal site visits, representing all four seasons. The purpose of the monitoring period is to record data on bat species on site and bat foraging habitats on site. Of relevance to bat sensitivity is the land use, vegetation, climate and topography of the study area, as these factors influence possible roosting space, while climate can influence availability of food and insects.

There are various bat species in the vicinity of the site that are common in the area. Some of these bat species have been confirmed on site by the Bat specialist. According to Animalia (2019) some of these species on site are of special importance based on their likelihood of being impacted by the proposed wind farm, due to high abundances and certain behavioural traits. The relevant species are listed in Table 6.14 below. Based on the bat sensitivity report and four seasons of pre-construction monitoring of the bat species recorded on site, the three most prominent species include the Egyptian free-tailed bat *Tadarida aegyptiaca*, the Cape serotine *Neoromicia capensis*, and the Natal long-fingered bat *Miniopterus natalensis* species.

These three species are most likely to be impacted by the proposed wind farm. The species are more abundant and are of a large value to the local ecosystems as they provide a greater contribution to most ecological services than the rarer species, due to their higher numbers. On the majority of recording systems, the passive data is showing *Tadarida aegyptiaca* to be the dominant species on site and especially at height, but with *Neoromicia capensis* dominating at short mast SM1 (34.125598°S, 24.498722°E) and SM3 (34.139070°S, 24.655086°E). In general bat activity at 97 m was significantly lower than at 10 m.

Approximately 7 km south-west of the site are approximately five caves situated near the Klasies river mouth, and two of them houses insectivorous bats and small numbers of fruit bats. *Miniopterus natalensis*, a cave dwelling species, have been recorded by the passive systems on site but at low activity levels.

Table 6.14: Bat species confirmed on the Impofu West site

Scientific name	Common name	Conservation status (SANBI &EWT 2016)
Tadarida aegyptiaca	Egyptian free-tailed bat	Least Concern (2016 Regional Listing)
Neoromicia capensis	Cape serotine	Least Concern (2016 Regional Listing)
Miniopterus natalensis	Natal long-fingered bat	Near-Threatened (National Listing)
Eptesicus hottentotus	Long-tailed serotine	Least Concern (2016 Regional Listing)
Rhinolophus clivosus	Geoffroy's horseshoe bat	Near-Threatened (2004 National Listing)
Myotis tricolor	Temmink's myotis	Near-Threatened (2004 National Listing)
Pipistrellus hesperidus	Dusky pipistrelle	Least Concern (2016 Regional Listing)
Scotophilus dinganii	Yellow-bellied house bat	Least Concern (2016 Regional Listing)

6.5.2 Site sensitivity

Bat sensitivity is directly related to features identified as important for foraging and roosting for the bat species that most commonly occur on site, therefore site sensitivity is based on the species ecology and habitat preferences. Habitat preferences include irrigation centre pivots, wetlands and drainage lines. The foraging habitats and roosting sites (including the Klasies River coastal caves and the Tsitsikamma River Valley), including vegetation and open watercourses are considered to have a significant role for bat ecology.

A sensitivity map was drawn up prior to the Pre-Application phase of the project indicating potential roosting and foraging areas. The map indicated High Bat Sensitivity areas which are expected to have elevated levels of bat activity and support greater bat diversity. High Bat Sensitivity areas and their buffers are No-Go areas due to expected elevated rates of bat fatalities due to wind turbines. The sensitivity map has been updated since the Pre-Application Phase of the project as the 12-month bat monitoring study has progressed. This led to some turbines falling within the new No-Go areas as shown in the Scoping Report (Aurecon, 2018). In the EIA Phase, the bat high sensitivity areas were again adjusted, and this resulted in the site layout being further refined to ensure turbines do not fall in the High Bat Sensitivity areas (No-Go areas). Refer to the amended sensitivity map in Figure 6.18 and also the bat specialist report in this regard.

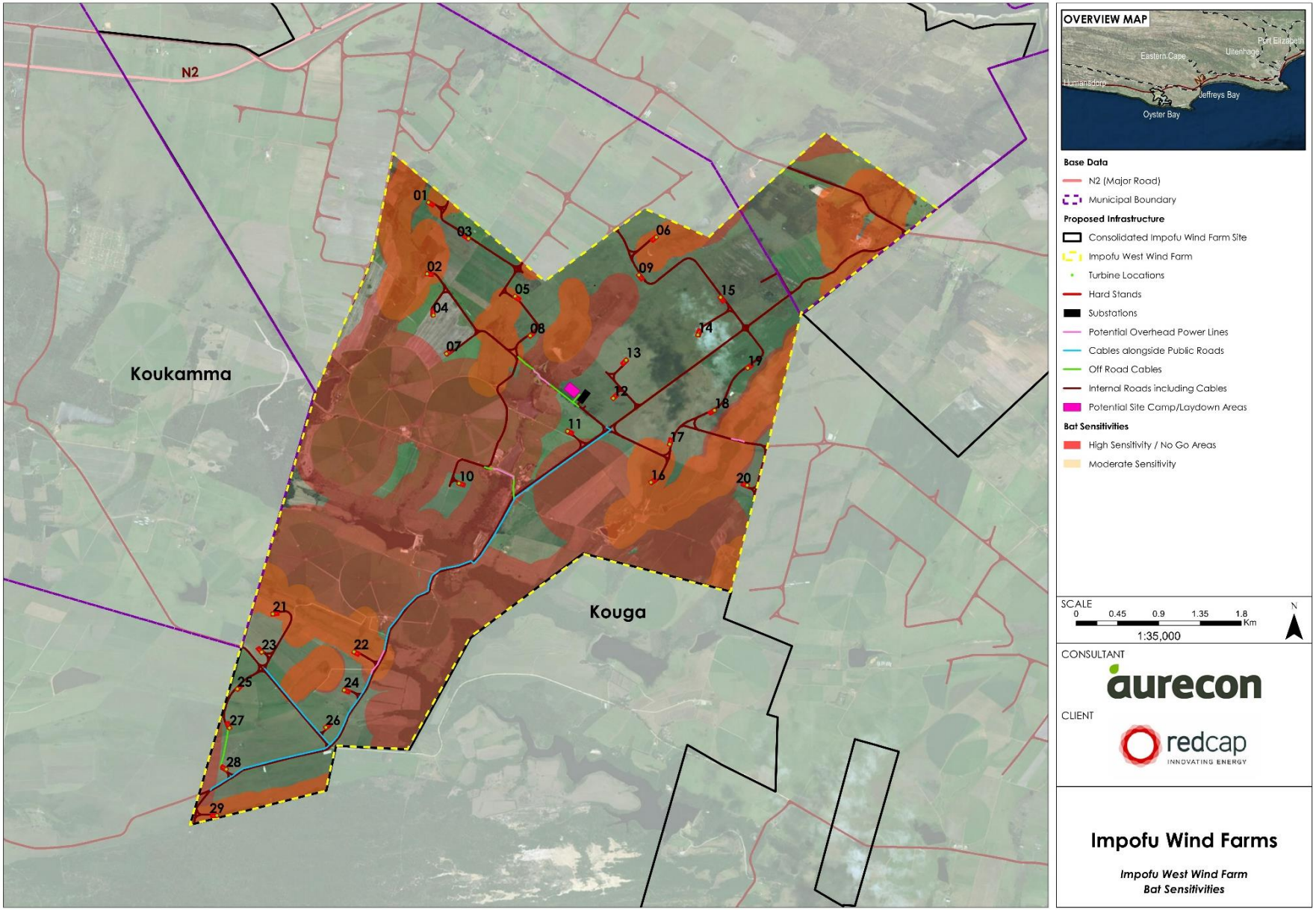


Figure 6.18: Impofu West bat sensitivity map, showing moderate (yellow) and high (red) sensitivity zones

6.5.3 Impact assessment with mitigation

The impacts on bat sensitivity that could potentially result from the proposed construction and operation of the proposed Impofu West Wind Farm were specifically in relation to the potential increase of bat mortalities due to moving turbines and bat habitat destruction and disturbance. The following tables consider the potential impacts on the bats and these impacts are summarised as:

- During construction some very limited foraging habitat will inevitably be destroyed to clear ground for the wind farm;
- Bat mortalities due to moving turbine blades during operation; and
- Increased bat mortalities due to light attraction during operation.

Table 6.15: Construction impact: destruction of foraging habitat by clearing vegetation

Phase		**Construction**		
Impact description	The clearance of vegetation during construction for wind farm associated infrastructure such as hardstands, roads, substations and laydown areas is likely to cause destruction of the very limited foraging habitat. Due to the small percentage of the site being transformed for turbines and associated infrastructure construction, the impact on bat foraging habitat is deemed as negligible. The *Tadarida aegyptiaca* species found to be occurring most on site have a very wide habitat tolerance and will utilise the open spaces on site for foraging, while the layout respects the high bat sensitivity areas which constitutes the majority of the foraging habitat for *Neoromicia capensis* and *Miniopterus natalensis*.			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term		Short term	
Extent	Very Limited		Very Limited	
Intensity	Negligible		Negligible	
Significance	**NEGLIGIBLE (-)**		**NEGLIGIBLE (-)**	
Probability	Almost certain/ Highly Probable		Almost certain/ Highly Probable	
Confidence	High		High	
Reversibility	High		High	
Resource irreplaceability	Low		Low	
Mitigation measures				
• Rehabilitate cleared vegetation where possible at areas such as temporary laydown areas.				

Table 6.16: Operational impact: bat mortalities due to moving turbine blades

Phase			**Operational**	
Impact description	The project area indicates relatively high bat activity levels. Especially of *Tadarida aegyptiaca* which dominated at 97 m and utilises higher airspaces and have the capability of foraging in higher wind speeds than *Neoromicia capensis*. The latter had the highest occurrence on site at 10 m during the passive data period. *N. capensis* is a clutter edge forager meaning that turbines closer to high sensitivities have a higher probability of impacting this species. As the layout is well designed and avoids bat sensitivity this should result in it significantly reducing the probability and impacts on bat populations as well as			

	the significance of the impact. However, *T. aegyptiaca* is an open-air forager and therefore a probability still exists of it being impacted on even with a well-designed layout, therefore operational monitoring is essential in identifying the level of impacts and whether additional mitigation measures (additional to layout adjustments), should be used as necessary.	
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Duration	On-going	On-going
Extent	Local	Local
Intensity	Very high	Moderate
Significance	**MODERATE (-)**	**MINOR (-)**
Probability	Almost certain / Highly probable	Likely
Confidence	High	High
Reversibility	Medium	High
Resource irreplaceability	Medium	Medium
Mitigation measures		
• Curtailment to be applied initially to all turbines at the start of operation at Level 3 of the mitigation scale (Ninety-degree feathering of blades below manufacturer's cut-in speed so it is exactly parallel to the wind direction as to minimise free-wheeling blade rotation as much as possible without locking the blades). This is assuming that this is technically feasible with the turbines that are used for this wind farm. • Operational monitoring to identify the level of impacts and whether additional mitigation measures are necessary. • If above threshold mortalities are recorded, then the preliminary mitigation schedule (refer to Table 6.1 in the Bat Specialist Report as Appendix E3) should be consulted to advise on the mitigation to be applied at identified turbines at selected high risk bat activity times and weather conditions.		

Table 6.17: Operational impact: bat mortalities due to light attraction

Phase			**Operational**	
Impact description	The presence of security and operational lights used close to or on the wind turbines are likely to attract high insect numbers and thereby attract additional insectivorous bat activity. This is likely to increase the likelihood of impacts by turbine blades.			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	On-going		On-going	
Extent	Local		Local	
Intensity	Very High		Very Low	
Significance	**MODERATE (-)**		**NEGLIGIBLE (-)**	
Probability	Certain/ definite		Unlikely	
Confidence	High		High	
Reversibility	Medium		High	
Resource irreplaceability	Medium		Medium	

Mitigation measures
• Only using lights with low sensitivity motion sensors, that can switch off automatically when no persons are nearby, to prevent the creation of regular insect gathering pools. • Ensure all lights are down hooded.

6.5.4 No-Go alternative

The No-Go alternative assumes that the project is not developed and the proposed activity does not go ahead. In this scenario, the No-Go alternative will have no positive or negative effects on bat populations, as the environment will remain unchanged and *status quo* will be maintained.

6.5.5 Conclusion and recommendations

The Bat Specialist Report and pre-construction monitoring indicates that the bat species most likely to be impacted by the proposed Impofu West Wind Farm, are *Neoromicia capensis, Tadarida aegyptiaca* and *Miniopterus natalensis*. These more abundant species are of a large value to the local ecosystems as they provide a greater contribution to ecological services than the rarer species, due to their higher numbers. These bat species have a conservation status of Least Concern (IUCN Red List, 2016 in Animalia, 2019). *Miniopterus natalensis* is a migratory cave dwelling species which could be utilising the Klasies River coastal caves (approximately 7 km south-west of the site) for roosting. However, the temporal distribution of this species did not indicate any migratory events and no indication of a migratory event is evident in the 12 months pre-construction data. Additional to this is that based on the currently available data from the 4 operational wind farms and other proposed wind farms in the area, there is nothing to date that indicates that the site is the location of a migratory path and overall this species was found to be low flying.

The potential impacts on bat species are mostly related to increased bat mortalities as a result of the presence of wind turbines with potential for direct impact with moving blades, or barotrauma, and destruction of bat habitat. The bat study has found that with the current turbine layout and the revised bat No-Go layers such impacts will have a moderate negative impact which can be reduced to a low significance through initial curtailment, operational monitoring and adaptive management. The cumulative impact assessment is described in Section 7 in further detail, but it is important to recognise here that impacts on bats cannot be viewed in isolation from existing operational wind farms and associated bat mortalities.

6.6 Avifauna

The information included in this section is drawn from the Avifaunal Specialist Report, including the preliminary pre-construction bird monitoring results, attached as Appendix E4, undertaken by Mr. Jon Smallie of Wildskies Ecological Services (Wildskies, 2019). Based on the spatial location of bird flight records, the bird monitoring and avifaunal habitat in the Avifaunal Specialist Report is considered in terms of the Impofu Wind Farms consolidated site (comprising Impofu West, North and East), since birds are mobile this presents a stronger assessment given the greater area surveyed, however, wind farm site specific mitigation measures are provided where relevant.

6.6.1 Baseline description

The proposed Impofu West Wind Farm study area consists of habitat which may sustain bird species likely to be impacted by the proposed wind farm. Adhering to the best practice guidelines, a 12 month monitoring schedule was initiated in June 2017 by an avifaunal specialist and has now been completed. The monitoring period included seasonal site visits, representing all four seasons. The purpose of the monitoring period is to record data on bird species on site and spatial patterns in bird flight movement. This seasonal sampling provided the specialist with the opportunity to undertake monitoring in summer (when summer migrants are present); winter (when raptors breed and Blue Cranes flock); spring (when summer migrants are arriving on site and

many species start to breed); and autumn (when summer migrants are leaving and many raptors are preparing to breed).

The Kouga area is at the southernmost tip of the continent and bird migration routes, and the specialist therefore suggests that the area does not experience migration bottle necks of the type experienced elsewhere on the continent. This is supported by the absence of significant migration related fatalities at the nearby operational wind farms.

Of relevance to the avifaunal environment is the climate, vegetation and habitat of the study area. The Avifauna Specialist Report considered vegetation on the site with regards to potential bird micro-habitats (refer to Figure 6.19). A number of bird micro habitats are available to birds in the study area and these include: manmade dams, wetlands, rocky ridges, pasture/crops, Fynbos, exotic trees and thicket. As described in Section 6.3.1, the vegetation of the Impofu West Wind Farm is mapped as Tsitsikamma Sandstone Fynbos and Southern Cape Dune Fynbos, with small portions of Eastern Coastal Shale Band Vegetation and Garden Route Shale Renosterveld. The importance of this vegetation class from an avifaunal perspective is reduced by the very high level of transformation of vegetation in the study area as a result of the current agricultural land use activities such as pasture and crop production.

Based on the findings of the 12 month pre-construction monitoring, a total of 190 bird species have been recorded on the consolidated Impofu Wind Farms site, with a peak in species richness in summer (149), followed by spring (143), autumn (127) and winter (113). A total of 84 small terrestrial bird species were recorded on the consolidated Impofu Wind Farms site, from the site visits and 15 walked transects which were conducted (see the Avifaunal Specialist Report for the full data set). The most abundant small terrestrial bird species on site are species already known to be common in the area, such as; Cape Canary (*Serinus canicollis*), Barn Swallow (*Hirundo rustica*), African Pipit (*Anthus cinnamomeus*), Red-eyed Dove (*Streptopelia semitorquata*), Grey-backed Cisticola *(Cisticola subruficapilla)* and African Stonechat (*Saxicola torquatus*). Of the 84 recorded small terrestrial bird species on site none are regionally Red Listed[8] (Taylor *et al*, 2015) and nine are regionally endemic. Based on the Avifaunal investigation, this is a relatively low level of endemism, due to the current site activities and majority of the site being comprised of transformed habitat and therefore less likely to provide habitat for specialist bird species.

The endemic species recorded on site include: Cape Weaver (*Ploceus capensis*), Cape White-eye (*Zosterops virens*) Karoo Prinia (*Prinia maculosa*); Cape Grassbird (*Sphenoeacus afer*), Cape Bulbul (*Pycnonotus capensis*) Fiscal Flycatcher (*Sigelus silens*) Greater Double-collared Sunbird (*Cinnerys afer*), Sentinel Rock Thrush (*Monticola exploratory*) and Knysna Turaco (*Tauraco corythaix*). These endemic species are fairly represented in a variety of habitats. Species diversity indicated little seasonal variation, with a slight peak in spring of 53 species, followed by winter (52), autumn (51), and summer (49).

A total of 15 large terrestrial species and raptors were recorded on the Impofu Wind Farms site, from the site visit and the seven drive transects which were conducted (see the Avifaunal Specialist Report as Appendix E4 for the full data set). The most abundant species recorded on site is the White Stork (*Ciconia ciconia)*, which is most dominant in summer. The second most abundant species is Denham's Bustard (*Neotis denhami),* abundant in all four seasons, and is followed by the Jackal Buzzard (*Buteo rufofuscus)* which is also relatively high in abundance in all four seasons.

Nine priority bird species were classified for the assessment of the consolidated site and are listed in Table 6.18 below (the small bird community was not considered topmost priority). Priority bird species recorded on site are also identified as priority bird species for the broader Kouga area.

[8] Red Listed species refer to those that are categorised as being Threatened – either as Vulnerable, Endangered, or Critically Endangered.

Figure 6.19: Typical micro-habitats available to birds in the Impofu Wind Farms study area

Table 6.18: Priority Bird species considered for assessment on the Impofu Wind Farms site

Scientific name	Common name	Conservation status
Neotis denhami	Denham's Bustard	Vulnerable regionally (Taylor *et al*., 2015) Near-threatened globally (IUCN, 2017)
Eupodotis senegalensis	White-bellied Korhaan	Vulnerable regionally (Taylor *et al*., 2015) Least concern globally (IUCN, 2017)
Anthropoides paradiseus	Blue Crane	Near-threatened regionally (Taylor *et al*., 2015) Vulnerable globally (IUCN, 2017) Endemic (almost entirely to SA)

Scientific name	Common name	Conservation status
Circus maurus	Black Harrier	Endangered regionally (Taylor *et al*., 2015) Endangered globally (IUCN, 2017) Near-endemic
Circus ranivorus	African Marsh-Harrier	Endangered (Taylor *et al*., 2015) Least concern globally (IUCN, 2017)
Polemaetus bellicosus	Martial Eagle	Endangered regionally (Taylor *et al*., 2015) Vulnerable globally (IUCN, 2017)
Haliaeetus vocifer	African Fish-Eagle	Least concern globally (IUCN, 2017)
Buteo rufofuscus	Jackal Buzzard	Least concern globally (IUCN, 2017) Endemic
Ciconia ciconia	White Stork	Least concern globally (IUCN, 2017)

The Secretarybird (*Sagittarius serpentarius)* is also one of the 15 large terrestrial species and raptors recorded on the consolidated site. Although it is one of the three large terrestrial regionally Red Listed species observed on the consolidated site, it is not considered a priority species for the assessment.

Twenty-one relevant bird species were recorded flying on the overall Impofu Wind Farms site. Six of these are regionally Red Listed and include: Martial Eagle (Endangered), Black Harrier (Endangered), African Marsh-Harrier (Endangered), Denham's Bustard (Vulnerable), Lanner Falcon (*Falco biarmicus*) (Vulnerable); and Blue Crane (Near-threatened).

The five most frequently recorded flying species on the consolidated Impofu Wind Farms site (in order of frequency) are: White Stork, Blue Crane, Denham's Bustard, Jackal Buzzard and African Marsh-Harrier. The flight activity recorded for the African Marsh-Harrier on the consolidated site is much higher than previously recorded elsewhere in the area. The flight paths of the five most frequent fliers are illustrated collectively on Figure 6.20. The flight activity recorded on the Impofu West site for the priority species is listed in Table 6.19.

Table 6.19: Flight activity recorded for the priority species on the Impofu Wind Farms site (the Impofu Winds Farms five most frequent fliers are bolded)

Common name	Number of flights on Impofu West	Mean height of recorded flights on the consolidated site
White Stork	**28 flight records on Impofu West in summer only**	**49.42 m above ground**
Blue Crane	**17 flight records on Impofu West**	**45.7 m above ground**
Denham's Bustard	**14 flight records on Impofu West**	**23.15 m above ground**
Jackal Buzzard	**34 flight records on Impofu West**	**60.68 m above ground**
African Marsh-Harrier	**17 flight records on Impofu West**	**15.03 m above ground**
African Fish-Eagle	Eight times	-
Martial Eagle	Three times	-
White-bellied Korhaan	Not recorded flying on Impofu West	-
Black Harrier	Not recorded flying on Impofu West	-

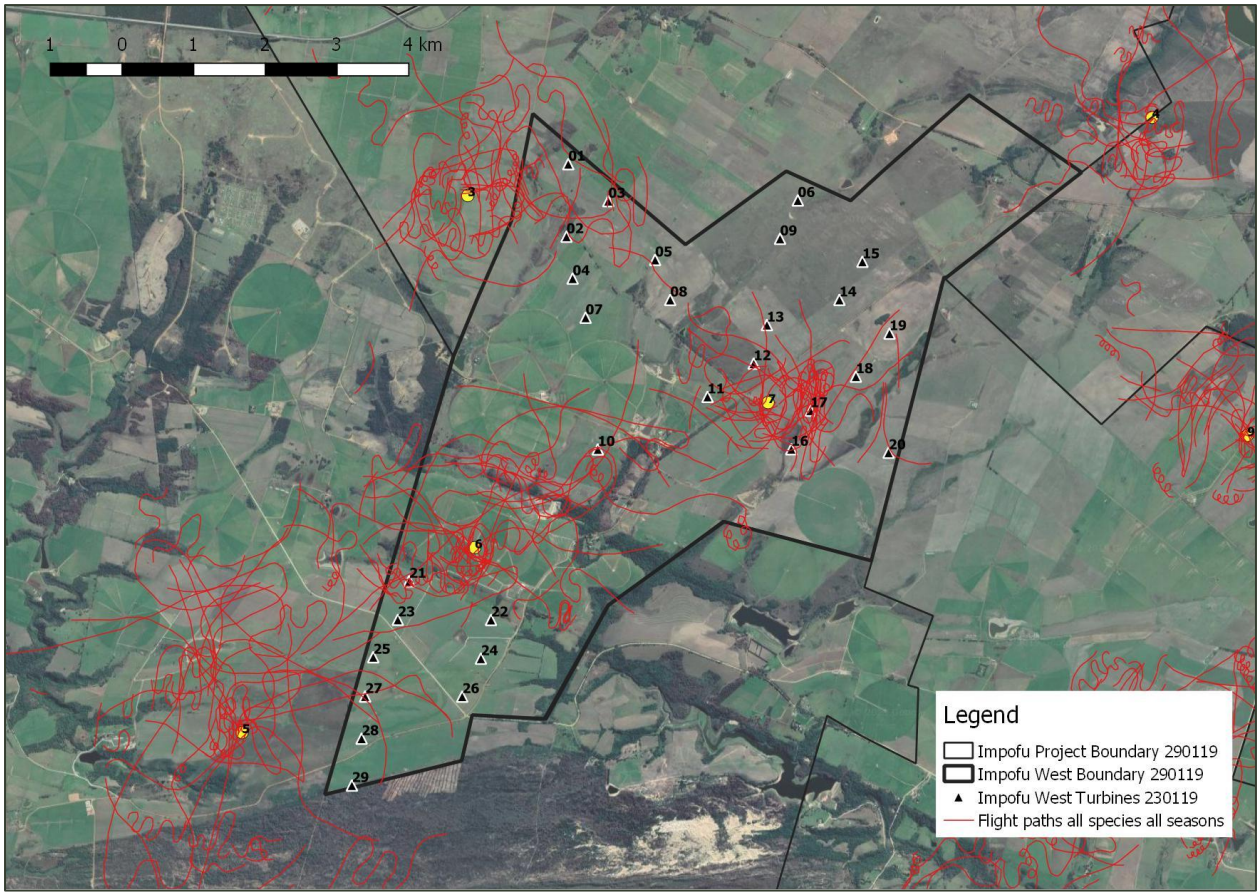


Figure 6.20: Recorded flight paths of most frequent fliers at Impofu West Wind Farm (all 5 species, 4 seasons) (Wildskies, 2019)

A Martial Eagle nest is located on the northern side of the Impofu Dam as shown in Figure 6.21. The nest is located approximately 2 km north of the original Impofu Wind Farms site boundary. The presence of this nest has significant implications for the proposed development. To avoid risks to these eagles a 6 km radial buffer around the nest site was declared a No-Go area during the Iterative Design Phase, refer to Section 4.2.1. This buffer is based on the most recent and comprehensive tracking-based study of Martial Eagles (Van Eeden *et al,* 2017).

Figure 6.21: The location of the Martial Eagle nest in relation to the Impofu West Wind Farm (Wildskies, 2019)

6.6.2 Site sensitivity

Avifaunal sensitivity is directly related to Important Bird and Biodiversity Areas (IBBA). According to Wildskies (2019) the Impofu West Wind Farm site falls between the lowest and second lowest sensitivity category in terms of avifauna, this is because the study area is not located in an IBBA. The closest IBBA's to the Impofu Wind Farms site are approximately 31 km north (Kouga-Baviaans) and 31 km west (Tsitsikamma National Park). On a national level, the broader Kouga area has been identified as an important area for three large terrestrial bird species, mainly the Blue Crane, Denham's Bustard, and White-bellied Korhaan (Van Rooyen and Froneman, 2013). With this in mind and based on the findings of the avifaunal investigation for the project, on the balance of predicted impacts, the Impofu West Wind Farm site falls in an area of low to moderate sensitivity on a national scale.

The on-site sensitivity for the consolidated site was assessed during the Screening and Iterative Design Phase and considered: wetlands and associated drainage lines/streams, dams, mini gorges, Fynbos/Renosterveld, and the Martial Eagle nest. All of these aspects were avoided during the Screening and Iterative Design Phase as shown in Figure 6.22.

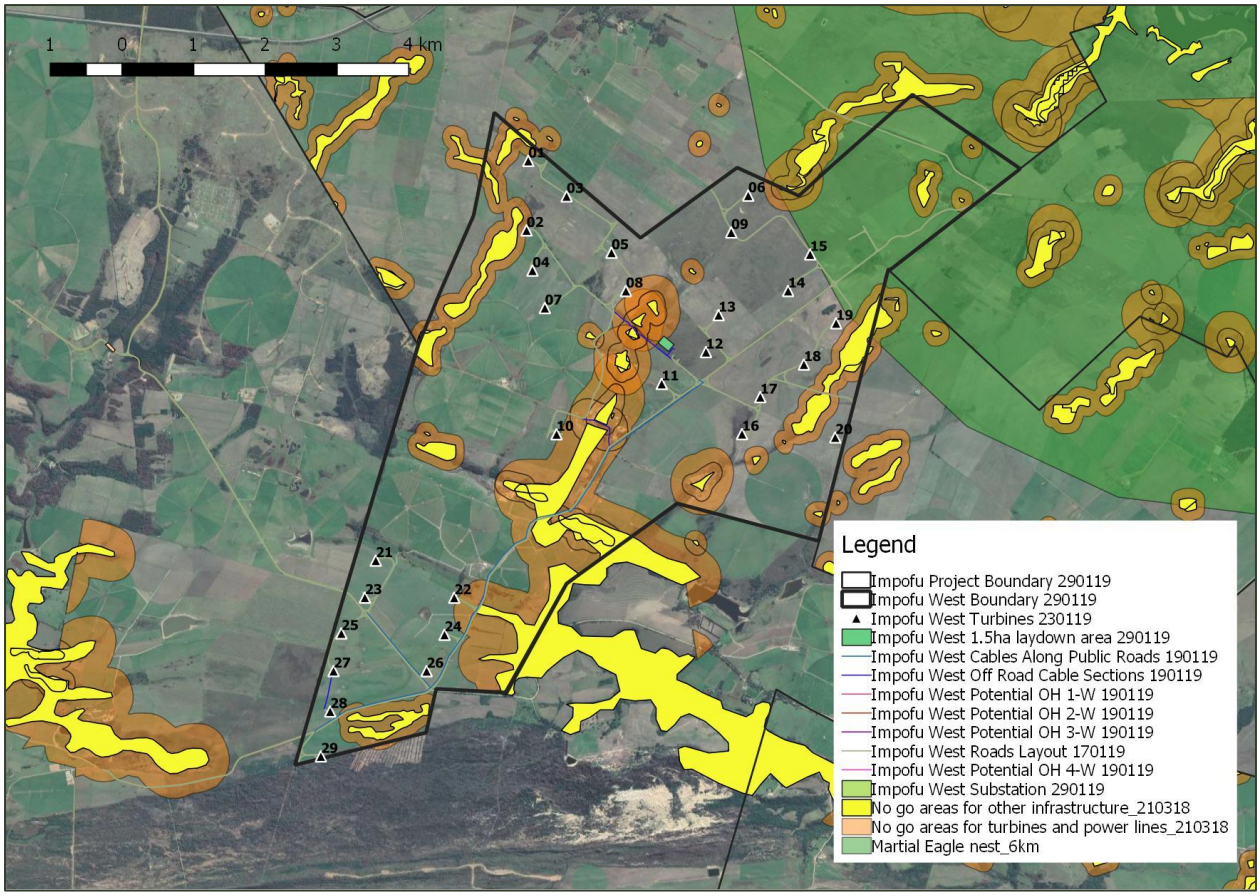


Figure 6.22: Avifaunal sensitivity map for the Impofu West Wind Farm (Wildskies, 2019)

6.6.3 Impact assessment with mitigation

The impacts on avifauna that could potentially result from the proposed construction and operation of the proposed wind farm were specifically in relation to the potential increase of collisions with wind turbines which is a direct mortality factor, habitat destruction and disturbance as well as displacement and barrier effects presented by the wind turbines. The following tables consider the potential impacts on the avifauna which have been summarised as:

- Destruction of bird habitat during construction;
- Disturbance of birds during construction;
- Disturbance of birds during operation;
- Displacement of birds from site during operation;
- Bird fatalities through collision with wind turbine blades; and
- Bird collision and electrocution on overhead powerlines during operation.

Table 6.20: Construction impact: destruction of bird habitat

Phase		Construction		
Impact description	The construction of the consolidated Impofu Wind Farms is likely to result in the loss of approximately 119 ha of land that will be transformed for roads, turbines, hard stands, switching station and electrical cabling. At the Impofu West Wind Farm approximately 36.54 ha would be lost or transformed by the wind farm activities, areas that were previously available as bird habitats are likely to be transformed and will no longer be useful to bird species. Given the importance of arable lands for key bird species			

	(Denham's Bustard, Blue Crane, White-bellied Korhaan, White Stork) avoiding the other sensitive habitats does not fully mitigate the significance of this impact	
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Duration	Permanent	Permanent
Extent	Limited	Limited
Intensity	Moderate	Moderate
Significance	**MODERATE (-)**	***LOW TO MODERATE (-)**
Probability	Certain/ definite	Certain/ definite
Confidence	High	High
Reversibility	High	High
Resource irreplaceability	Low	Low
Mitigation measures		
• An avifaunal walk down should be conducted to confirm final turbine layout and identify any sensitivities that may arise between environmental authorisation and the construction phase. • All construction activities should be strictly managed according to generally accepted environmental best practice standards, to avoid any unnecessary impact on the receiving environment.		

Table 6.21: Construction and decommissioning impact: disturbance of birds

Phase	**Construction**	**Decommissioning**
Impact description	The construction and decommissioning of the Impofu West Wind Farm is likely to cause disturbance to bird species, breeding birds are likely to be disturbed by human, vehicle and machinery movement on site, including noise and vibrations. This is likely to result in reduced breeding productivity, breeding fails and abandonment of breeding bird sites. However, the avoidance measures already taken to protect the Martial Eagle nest and territory have reduced the significance of this impact to Negligible negative significance.	
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Duration	Permanent	Permanent
Extent	National	National
Intensity	Low	Low
Significance	**NEGLIGIBLE (-)**	**NEGLIGIBLE (-)**
Probability	Rare/ improbable	Rare/ improbable
Confidence	High	High
Reversibility	High	High
Resource irreplaceability	Medium	Medium
Mitigation measures		
• An avifaunal walk down should be conducted to confirm final turbine layout and identify any new sensitive species breeding sites. • Monitoring of breeding status of Martial Eagles should be conducted in all breeding seasons post acceptance of the project as preferred bidder (to establish baseline) and including during and post construction.		

- All construction activities should be strictly managed according to generally accepted environmental best practice standards, so as to avoid any unnecessary impact on the receiving environment.

Table 6.22: Operational impact: disturbance of birds

Phase			Operational	
Impact description	Breeding birds disturbed by human, vehicular and machinery activity on site. Breeding productivity reduced, or breeding fails or breeding site abandoned. The indications from operational wind farms are that this impact may be of fairly low importance, although it is acknowledged that a longer term or more detailed means of measuring this impact may be required.			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent		Permanent	
Extent	National		National	
Intensity	Low		Low	
Significance	**MINOR (-)**		**MINOR (-)**	
Probability	Unlikely		Unlikely	
Confidence	Medium		Medium	
Reversibility	Low		High	
Resource irreplaceability	Medium		Medium	
Mitigation measures				
• None required.				

Table 6.23: Operational impact: displacement of birds

Phase			Operational	
Impact description	The operation of the proposed Impofu West Wind Farm could result in birds displaced from the site thereby losing areas for their foraging, roosting and breeding. Avoidance has already been applied with regard to the sensitive Martial Eagle nest.			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent		Permanent	
Extent	Limited		Limited	
Intensity	Very low		Very low	
Significance	**NEGLIGIBLE (-)**		**NEGLIGIBLE (-)**	
Probability	Unlikely		Unlikely	
Confidence	Low		Low	
Reversibility	High		High	
Resource irreplaceability	Low		Low	

Mitigation measures
• Monitoring of breeding status of Martial Eagles should be conducted in all breeding seasons prior to and during construction. • An avifaunal walk down should be conducted to confirm final layout and identify any sensitivities that may arise between environmental authorisation and construction. • All construction activities should be strictly managed according to generally accepted environmental best practice standards, so as to avoid any unnecessary impact on the receiving environment.

Table 6.24: Operational impact: bird fatality through collision with turbine blades

Phase			Operational	
Impact description	The presence of operational wind turbines presents the possibility for bird fatalities through collision with wind turbine blades. Thresholds against which the estimated fatalities can be measured is based on a number of assumptions and the significance is judged per species. The significance is found to be Moderate for six species: Denham's Bustard; Blue Crane; African Marsh-Harrier; Martial Eagle; Jackal Buzzard and White Stork. Avoidance measures imposed during the design phase have already reduced the significance of this impact to Moderate but not lower.			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent		Permanent	
Extent	National		National	
Intensity	Moderate		Moderate	
Significance	**MODERATE (-)**		**MODERATE (-)**	
Probability	Likely		Likely	
Confidence	High		High	
Reversibility	Medium		Medium	
Resource irreplaceability	Medium		Medium	
Mitigation measures				
• An avifaunal walk down should be conducted to confirm final layout and identify any sensitivities that may arise between environmental authorisation and construction. • At this stage it is not possible to determine what mitigation may be appropriate, and in the time between writing this report and the mitigation need arising (likely several years) new mitigation methods may be developed. Therefore provision for mitigation contingency budget for the operational phase should be made by the developer, the details are included in the Avifauna Specialist Report. • If Blue Crane turbine or power line collision fatalities occur as a result of livestock feeding points once the facility is operational, this will need to be mitigated, probably by restricting farmers from feeding too close to turbines (200-300 m) and power lines. or by covering/ obstructing the feeding points in some way that prevents the birds from easily feeding from them (as was done successfully with fence wires at an existing wind farm in the Overberg area for feeding points for sheep). Landowners should be made aware of this possibility at the outset of the project.				

Table 6.25: Operational impact: bird collision and electrocution on overhead power lines

Phase			Operational	
Impact description	The presence of overhead powerlines and substation has the potential to cause bird collision and electrocution. Birds in flight collide with overhead cables and are likely to be killed or injured, birds perching on pylons are likely to be electrocuted or killed.			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent		Permanent	
Extent	National		National	
Intensity	Low		Low	
Significance	**MINOR (-)**		**NEGLIGIBLE (-)**	
Probability	Probable		Rare/ improbable	
Confidence	High		High	
Reversibility	Low		Low	
Resource irreplaceability	High		High	
Mitigation measures				
• An avifaunal walk down should be conducted to confirm final layout and identify any new sensitivities. • Overhead conductors or earth wires should be fitted with an Eskom approved anti bird collision line marking device to make cables more visible to birds in flight and reduce the likelihood of collisions. • Pylons or poles must be designed according to Eskom approved bird friendly designs to ensure that perching large birds cannot be electrocuted.				

6.6.4 No-Go alternative

Should the proposed project not proceed, the current *status quo* will be maintained. No wind farm and associated infrastructure will be built on site. The impact of the No-Go alternative on the environment from an avifaunal perspective is low negative, none of the potential impacts on birds would take place.

6.6.5 Conclusion and recommendations

The findings of the Avifaunal investigation indicate that 84 small bird species are found on the consolidated Impofu Wind Farms site. None of these species are regionally Red Listed and nine are regionally endemic or near-endemic, with a relatively low level of endemism. Fifteen large terrestrial or raptor species were recorded on the consolidated Impofu Wind Farms site. Two species are endemic or near-endemic, which appears to be of low levels than elsewhere in the broader Kouga region. A Martial Eagle nest was found to the north of Impofu Dam, well off the Impofu West Wind Farm site, the avoidance measure of a 6 km buffer to protect the Martial Eagle nest and territory has been implemented in the turbine layout.

The potential impacts on avifauna are mostly related to increased bird and habitat destruction and risk of collision during operation. The Avifaunal investigation found that such impacts will either be moderate negative or negligible negative impact on avifauna in the study area. An avifaunal walk down of the site prior to construction along with the provision of a mitigation contingency budget for the operational phase remains the foremost means of mitigating the impacts on avifauna after the detailed site layout adjustments that were undertaken during the Screening and Iterative Design Phase. It is also recommended that the during construction and post construction monitoring programme outlined in Appendix 4 of the avifaunal specialist report be implemented according to the latest available version of the best practice guidelines at the time. The cumulative impact assessment is described in Section 7 in further detail, but it is important to recognise here

that impacts on birds cannot be viewed in isolation from existing operational wind farms and associated bird mortalities.

6.7 Agriculture

The information included in this section is drawn from the Agriculture Specialist Report attached as Appendix E5, undertaken by Mr Johann Lanz (Lanz, 2019).

6.7.1 Baseline description

The proposed site is dominated by agricultural activities. The site and surrounding areas are currently used for intensive, high production dairy farming with some areas of cultivated, kikuyu based pasture and additional fodder crops, both under irrigation, as well as non-irrigated. Due to the soils and climatic conditions of the site dairy farming is the most suitable agricultural land use. Agricultural activities adjacent to the site comprises of cultivated dairy farms. A small percentage of the area is also utilised for beef cattle farming. Due to the climatic conditions of the area, crops that are capable to grow in these conditions include macadamia nuts.

The project area is classified with land capability evaluation values that vary over the area from a minimum of 5 (low) to a maximum of 12 (high to very high) according to DAFF's 2017 15 point scale. The investigated soils are rated as low agricultural potential due to the physical and chemical characteristics of a soil profile which pose limitations which constrain crop production. The soils of the study area are naturally very acidic requiring high inputs of lime for agricultural use, this limits their water and nutrient holding capacity.

Despite the limitations which constrain crop production and soil limitations, the agricultural environment (the combination of soils and climate) of the study area is highly suitable for intensive and productive dairy farming on kikuyu based pastures. Limitations on pasture cultivation are on patches of rock outcrop and associated shallow rock banks as well as areas constrained by topography such as river gorges and mountainous land.

In terms of agricultural potential, there is sufficient rainfall on the site to support viable agricultural production of dryland fodder crops for dairy cows. Where dams are available, there is sufficient rainfall for water storage for irrigation purposes. Groundwater also serves as a source of water supply in the study area and is predominantly used for irrigation.

6.7.2 Site sensitivity

Agricultural sensitivity is directly related to the capability of the land for agricultural production, including production capability enabled by infrastructural and other agricultural improvements made to the land. This is because a negative impact on land of higher agricultural capability is more detrimental to agriculture than the same impact on land of low agricultural capability.

According to the agricultural study, the natural agricultural potential of the site is constant, except for limitations on the patches of rock outcrop that occur. The differences in agricultural production capability across the site are the result of the agricultural improvements that have been made. Irrigated land has a higher production capability than non-irrigated land, and it therefore has the highest agricultural sensitivity. The field investigation categorised the site agricultural sensitivity into four categories, low, moderate, high and No-Go based on significant agricultural sensitivity. Areas that are suitable for cultivation but with limitations were classified as moderate. Areas that are suitable for cultivation and could potentially be developed as irrigated land were classified as having high sensitivity. Centre pivot irrigated lands were classified as No-Go areas. The No-Go areas are shown in Figure 6.23 below. All No-Go areas have been considered and avoided in the current design layout of the proposed wind farm.

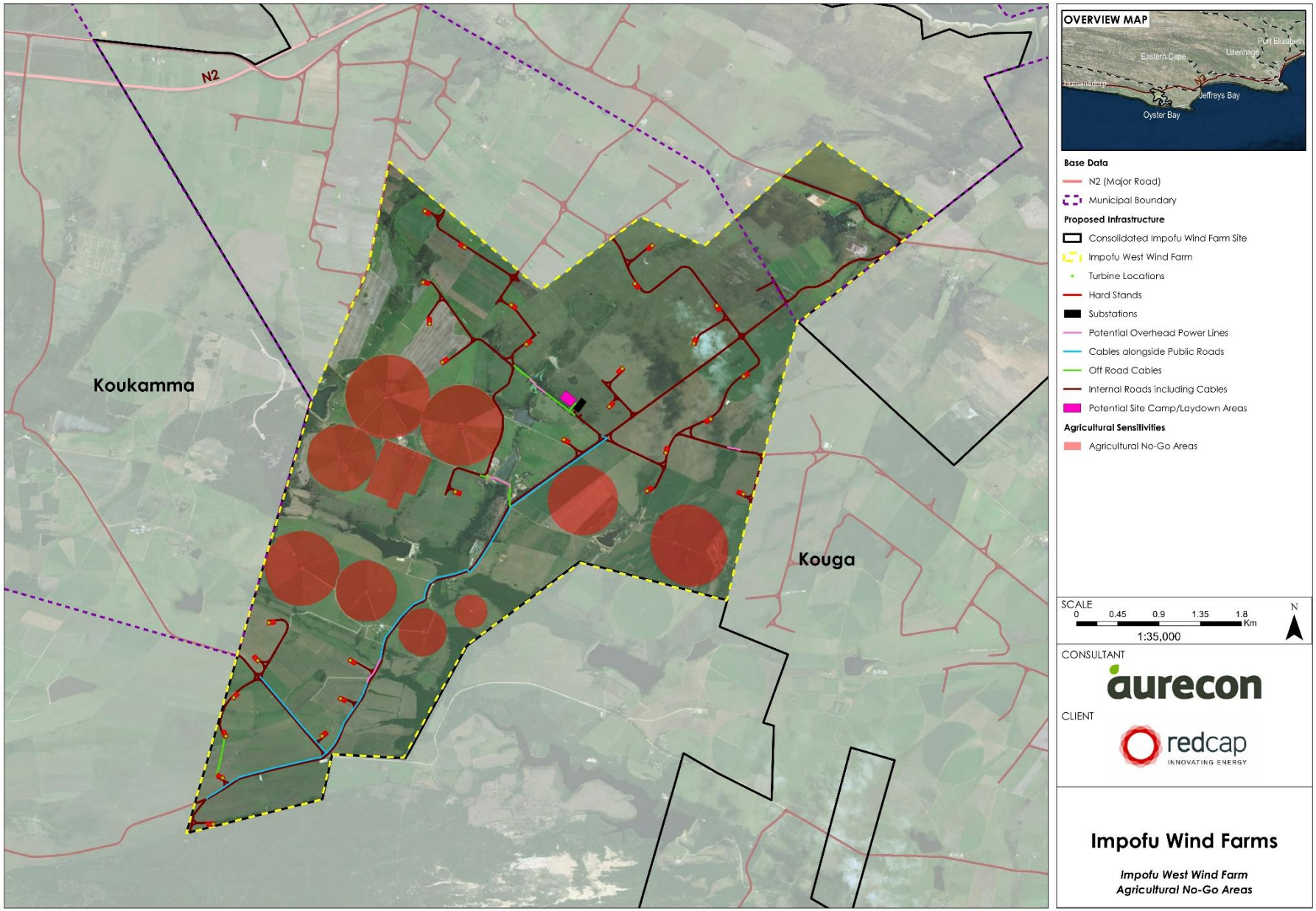


Figure 6.23: Proposed layout of the Impofu West Wind Farm and Agricultural No-Go areas

6.7.3 Impact assessment with mitigation

The agricultural assessment has been informed by a case study undertaken by Lanz (2019. The site is surrounded by operational wind farms which presented the opportunity to collect primary data regarding the potential impacts (both negative and positive) that the three operational wind farms (Jeffreys Bay, Kouga, and Gibson Bay) have had on agricultural resources and production. Negative and positive impacts were identified based on interviews and actual production data and the findings are summarised as follows:

- Loss of agricultural land is extremely limited (less than 1% of the land surface);
- Farming has not been discontinued or reduced on any of the farms, and one landowner had improved financial security to enable him to farm full time;
- There has been zero reduced production as a result of disturbance or interference to their farming practices by the wind farms, during both construction and operation (e.g. noise);
- Farmers do not perceive the wind farms to have had a negative impact on the natural agricultural resource base, through erosion or loss of topsoil;
- Farmers do not perceive the wind farms to have used water resources during construction that could otherwise have been used for agricultural production;
- Increased financial security for farming operations due to reliable income from land rental to the wind farms, resulting in further investment in farming, and in one case access to additional finance; and
- Improved condition of road infrastructure due to contributions from wind farms, as well as improved access to private land through internal access roads.

The overall conclusion of this study is that, although wind farms have been established within an area of cultivated farmland that supports intensive and productive dairy farming, it is highly unlikely that this has caused a reduction in agricultural production, and therefore had any negative agricultural impact. Small amounts of production land have been lost, but the consequence of this for agricultural production has been negligible. It is likely, that the positive impacts of wind farming, particularly increased financial security, have outweighed the negative impacts and that wind farming has benefited agriculture and agricultural production in the area. This conclusion is supported by the affected farmers, who are the people that have the most relevant experience on which to base an assessment of these impacts.

The following impacts have therefore been assessed in the tables below:

- Loss of agricultural land;
- Discontinuation of farming activities;
- Interference with farming operations;
- Degradation to natural agricultural resource base;
- Depletion of potential agricultural water resources;
- Increased financial security for farmers;
- Improvements to shared infrastructure; and
- Improved farm security.

Table 6.26: Construction, operation and decommissioning impact: loss of agricultural land use

Phase		Construction	Operational	Decommissioning
Impact description	The project will result in the loss of agricultural productive land, or potentially productive land, that will be occupied by the wind farm infrastructure and will become unavailable for agricultural use.			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	On-going		On-going	

Extent	Very limited	Very limited
Intensity	Very low	Very low
Significance	**MINOR (-)**	**MINOR (-)**
Probability	Certain/ definite	Certain/ definite
Confidence	Medium	Medium
Reversibility	Medium	Medium
Resource irreplaceability	Medium	Medium
Mitigation measures		
• Mitigation has already been implemented during the design phase to limit the loss of productive land, this was done in association with the landowners / farmers.		

Table 6.27: Construction, operation and decommissioning impact: discontinuation of farming activities

Phase		**Construction**	**Operational**	**Decommissioning**
Impact description	The associated impacts of the wind farm on the farmers, such as noise, traffic, labour influxes and associated safety and security concerns, wind farm derived income and other lifestyle impacts could influence them to discontinue farming, leading to a drop in agricultural production. Based on the evidence from the agricultural case study, the risk of this impact having a significant effect on agricultural production is insignificant.			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term		N/A	
Extent	Limited		N/A	
Intensity	Very Low		N/A	
Significance	**NEGLIGIBLE (-)**		**N/A**	
Probability	Rare/ improbable		N/A	
Confidence	Medium		N/A	
Reversibility	High		N/A	
Resource irreplaceability	Low		N/A	
Mitigation measures				
• No mitigation measures exist.				

Table 6.28: Construction, operation and decommissioning impact: interference with farming operations

Phase		**Construction**	**Operational**	**Decommissioning**
Impact description	Wind farm activity and infrastructure, both during construction and operation, may disturb or interfere with farming practices, and thereby decrease productive efficiency on the farm and hence lead to decreased levels of agricultural production. The results of the case study show that the farmers have experienced a nuisance factor during the wind farm construction phase, but almost none in the operational phase, and no impact on production during either phase.			
	Without mitigation		**With mitigation**	

Nature	Negative	Negative
Duration	On-going	On-going
Extent	Limited	Limited
Intensity	Very low	Negligible
Significance	**NEGLIGIBLE (-)**	**NEGLIGIBLE (-)**
Probability	Unlikely	Rare/ Improbable
Confidence	Medium	Medium
Reversibility	High	High
Resource irreplaceability	Low	Low
Mitigation measures		
• Mitigation has already been implemented during the design phase to limit the loss of productive land, this was done in association with the landowners / farmers. • Install cattle grids where necessary to mitigate risk of gates being left open (refer to the Agricultural Report for the recommended design).		

Table 6.29: Construction, operation and decommissioning impact: degradation to natural agricultural resource base

Phase		**Construction**	**Operational**	**Decommissioning**
Impact description	Wind farm construction and operation may negatively impact on the natural agricultural resource base by way of soil erosion, topsoil loss, drainage disturbance and water availability. However, erosion risk is low because slopes are minimal and soils have a high infiltration rate and low susceptibility to water erosion. Because of the relatively high, year round rainfall, vegetation cover establishes quickly after disturbance and is very effective at preventing wind erosion. The case study revealed no evidence of such significant impacts to soil.			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term		Short term	
Extent	Very Limited		Very Limited	
Intensity	Low		Very Low	
Significance	**NEGLIGIBLE (-)**		**NEGLIGIBLE (-)**	
Probability	Likely		Unlikely	
Confidence	Medium		Medium	
Reversibility	Medium		Medium	
Resource irreplaceability	Medium		Medium	
Mitigation measures				
• Apply systems of stormwater run-off control. • Facilitate revegetation of denuded areas. • Strip, stockpile and re-spread topsoil at disturbed area.				

Table 6.30: Construction, operation and decommissioning impact: depletion of potential agricultural water resources

Phase		Construction	Operational	Decommissioning
Impact description	Wind farms, especially the construction thereof, could utilise water that could otherwise have been used for agriculture production. They could either be sourced through new boreholes or off-site. Furthermore, these quantities are small in relation to irrigation water use and duration of extraction will be limited.			
	Without mitigation		**With mitigation**	
Nature	Negative		N/A	
Duration	Short term		N/A	
Extent	Limited		N/A	
Intensity	Very low		N/A	
Significance	**NEGLIGIBLE (-)**		N/A	
Probability	Probable		N/A	
Confidence	Medium		N/A	
Reversibility	High		N/A	
Resource irreplaceability	Low		N/A	
Mitigation measures				
• The impact is of negligible negative significance and no mitigation is required.				

Table 6.31: Construction, operation and decommissioning impact: increased financial security for farmers

Phase		Construction	Operational	Decommissioning
Impact description	Income earned by the farmers from the turbines on their land may benefit farming operations and increase investment into agricultural infrastructure, and thereby improve agricultural production levels. Based on the case study there has been an upward trend in agricultural production which strongly suggests that this is a significant, positive impact on agriculture.			
	Without mitigation		**With mitigation**	
Nature	Positive		N/A	
Duration	On-going		N/A	
Extent	Limited		N/A	
Intensity	High		N/A	
Significance	**MODERATE (+)**		N/A	
Probability	Almost certain/ High probable		N/A	
Confidence	Medium		N/A	
Reversibility	High		N/A	
Resource irreplaceability	Low		N/A	
Mitigation measures				
• No mitigation is required.				

Table 6.32: Construction, operation and decommissioning impact: improvements to shared infrastructure

Phase		Construction	Operational	Decommissioning
Impact description	Investments by the wind farm into improving and maintaining shared infrastructure, such as public district and minor roads, as well as road and stormwater infrastructure on farms, may benefit farming operations, and thereby agricultural production. Refer to the TIA in Section 6.13 for further detail thereof. The results of the case study show that most farmers have experienced the changes to road infrastructure to date as being of some benefit to their farming operations, while some have experienced it as neutral.			
	Without mitigation		**With mitigation**	
Nature	Positive		Positive	
Duration	On-going		On-going	
Extent	Limited		Limited	
Intensity	Low		Low	
Significance	**MINOR (+)**		**MINOR (+)**	
Probability	Probable		Probable	
Confidence	Medium		Medium	
Reversibility	High		High	
Resource irreplaceability	Low		Low	
Mitigation measures				
• The impact is of minor positive significance and can be enhanced by using input from the farmers into the design phase which will increase the usefulness of turbine access roads for their farming operations.				

Table 6.33: Construction, operation and decommissioning impact: improved farm security

Phase		Construction	Operational	Decommissioning
Impact description	The presence of wind farm personnel, including security personnel in the area, could provide improved farm security. This impact could be positive or negative, because the influx of additional people associated with the wind farm could in fact increase security concerns. The results of the case study show that some farmers experience it as positive impact while others experience it as negative. Either way the impact is unlikely to be a significant agricultural impact.			
	Without mitigation		**With mitigation**	
Nature	Positive		N/A	
Duration	On-going		N/A	
Extent	Limited		N/A	
Intensity	Negligible		N/A	
Significance	***NEGLIGIBLE (+)**		**N/A**	
Probability	Probable		N/A	
Confidence	Medium		N/A	
Reversibility	High		N/A	
Resource irreplaceability	Low		N/A	

Mitigation measures
• No mitigation is required.

6.7.4 No-Go alternative

The No-Go alternative anticipates changes to the agricultural environment that would occur in the absence of the proposed development. In this scenario, the land is likely to remain at its current agricultural productivity. Therefore, the anticipated impact of the No-Go scenario on the environment from an agricultural perspective is neutral.

6.7.5 Conclusion and recommendations

The focus of the agricultural preliminary study was to determine to what extent the proposed Impofu West Wind Farm will compromise or enhance the current and future agricultural production of the study area. Based on the agricultural study and the investigated soils, the construction, operation and decommissioning of the proposed Impofu West Wind Farm and associated infrastructure is likely to result in a variety of direct and indirect impacts associated largely with the disturbance and loss of agricultural land. Most of the negative agricultural impacts are primarily influenced by the permanent footprint of disturbance caused by the wind farm infrastructure.

The proposed development is on land zoned and used for agriculture. Based on the agricultural case study, although the proposed development overlaps on cultivated farmland that supports intensive and productive dairy farming, the development is nevertheless highly unlikely to cause a reduction in agricultural production. A very small amount of production land will be lost, but the consequence of the lost land for agricultural production is negligible. It is likely that the positive impacts of the development will outweigh the negative impacts and that the development will therefore benefit farming and agricultural production.

The primary negative impact is therefore the loss of agriculturally zoned land. However, the areas to be impacted by the development are limited to only a small proportion of the total surface area of the site. In mitigating the negative impacts, the wind farm footprint has entirely avoided No-Go areas, identified at the Screening and Iterative Design Phase, and the layout design has had extensive input by the farmers, aimed at minimising the loss of productive land and of disturbance to their farming operations. Based on the agricultural case study (on-going), the Impofu West Wind Farm is likely to have a continued positive impact on the agriculture of the area, rather than threatening agriculture.

6.8 Socio-economic

The information included in this section is drawn from the Socio-economic Specialist Report attached as Appendix E6, undertaken by Mr Thomas Parsons from Urban-Econ Development Economists (Urban-Econ Development Economists, 2019).

6.8.1 Baseline description

The Impofu West Wind Farm site falls within the Kouga Local Municipality and the Sarah Baartman District Municipality. Land use is dominated by farming activities, mainly commercial dairy with cultivated dry-land and irrigated pastures. Currently, four operational wind farms are located in close proximity to the site, namely: Kouga Wind Farm, Gibson Bay Wind Farm, Tsitsikamma Community Wind Farm and Jeffreys Bay Wind Farm.

6.8.1.1 Population, income and employment profile

The following section provides an overview of the population, income and employment profile of the Kouga Local Municipality and is summarised in Table 6.34.

The Sarah Baartman District Municipality's total population was estimated at 444,735 individuals in 2016 (Stats SA, 2016), of which the Kouga Local Municipality accounts for 21.4% (95,270). The population growth within the Sarah Baartman District Municipality and Kouga Local Municipality was 0.9% between 2011 and 2016.

The average monthly income of households is relatively high at R10,598 for the Kouga Local Municipality and R8,889 for the Sarah Baartman District Municipality. Despite the relatively high household income for the Kouga Local Municipality, 15.3% of households do not have any income, resulting in a poverty headcount[9] that was recorded as 1.2% higher than the district average (4.5%), but lower than the provincial average (12.7%).

Table 6.34: Population, income and employment profile for the Sarah Baartman District Municipality and Kouga Local Municipality, 2016 (Quantec, 2016)

Indicator	Sarah Baartman District Municipality	Kouga Local Municipality
Population		
Population	444,735	95,270
Number of Households	122,911	28,173
Population density (km^2)	7.6	35.7
Average household size	3.6	3.4
Population growth rate (2011-2016)	0.4%	0.9%
Income		
Average monthly household income (2011, 2016 prices)	R 8,889	R10,598
Employment		
Labour force participation rate	63.0%	69.9%
Employed	150,081	37,998
Unemployed	35,157	6,045
Unemployment rate (% of labour force)	19.0%	13.7%

The employment profile for the Kouga Local Municipality indicates that only 13.7% of the total labour force is unemployed (consisting of scholars/students, pensioners and those who could not find work). This is notably lower than that of the Sarah Baartman District Municipality which has an unemployment rate of 19%[10].

According to the socio-economic study, these figures suggest that the Kouga Local Municipality is most likely experiencing an inward migration due to the availability of actual and perceived employment opportunities.

6.8.1.2 Economic profile

The Kouga Local Municipality contributed approximately 27.1% of the district municipality's Gross Domestic Product (GDP) in 2016 of which the largest contributors were finance and business services (26.4%), trade (21.3%), general government (16.6%) and manufacturing (11.2%). The agricultural sector contributes only a small proportion of GDP, but is considered an important employer, employing 8,422 or 22.1% of the working age population. The tourism industry within the Municipality is well established and characterised by a range of eco-tourism and adventure activities.

Even though the GDP contributions are considered relatively small, the Kouga Local Municipality is performing strongly in terms of its economic input due to its size and economic diversity. The Compounded Annual Growth Rate for the municipality was 2% over the past five years, indicating a faster growth rate than district (1.7%) and provincial economies (1.3%).

The transport, storage and communication sector has been growing by 3.2% over the last five years, making it the best performing sector. Other fast-growing sectors are general government (2.6%), manufacturing (2.3%) and finance and business services (2.3%). However, the mining and quarry sector's contribution to the GDP has been declining by 0.1% year-on-year between 2011 and 2016. In addition, the primary sector's contribution to the municipality's economy has declined from 5.8% to 5.3% over the same time period.

[9] Stats SA utilised the South African Multidimensional Poverty Index (SAMPI) to measure the extent of poverty in the country. The SAMPI is an index that is constructed using eleven indicators across four dimensions, namely: health, education, living standards and economic activity. Poverty headcount figures were then determined based on the proportion of households that are considered to be "multidimensional poor" in terms of the index (Urban-Econ Development Economists, 2018).
[10] Labour force participation rate: 63%

The agricultural sector has experienced an increase in both GDP and employment between 2011 and 2016 (see Table 6.35). During this period, over 2,000 jobs were created in the agricultural sector, making it the largest employment creator (at 6.9%) in the municipality.

Agricultural activities are labour intensive, so a small decline in the size of the sector would generally lead to more job losses than what would occur in a capital-intensive sector (e.g. manufacturing). For this reason, the agricultural sector is generally prioritised in development strategies.

Table 6.35: Employment profile of the Sarah Baartman District Municipality and Kouga Local Municipality according to the different economic sectors, 2011-2016 (Quantec, 2016)

Sector	Share of total employment				Absolute change 2011-2016
	Sarah Baartman District Municipality		Kouga Local Municipality		
	2011	2016	2011	2016	
Primary sectors	20.4%	23.5%	19.3%	22.2%	2.9%
Agriculture and hunting	20.4%	23.5%	19.3%	22.2%	2.9%
Mining and quarrying	0.0%	0.0%	0.0%	0.0%	0.0%
Secondary sectors	14.4%	14.2%	16.1%	15.3%	-0.8%
Manufacturing	6.5%	5.8%	5.9%	5.1%	-0.8%
Electricity, gas and water	0.3%	0.3%	0.3%	0.3%	0.0%
Construction	7.7%	8.1%	10.0%	9.9%	-0.1%
Tertiary sectors	65.1%	62.3%	64.6%	62.5%	-2.0%
Trade	24.5%	23.1%	27.1%	25.9%	-1.2%
Transport and communication	3.5%	3.6%	2.8%	2.9%	0.0%
Finance and business services	8.7%	8.3%	9.4%	8.8%	-0.7%
General government	12.5%	11.1%	10.3%	9.9%	-0.4%
Community services	16.0%	16.2%	14.9%	15.1%	0.2%
Total employment	**125,532**	**150,081**	**31,286**	**37,998**	**6,712**

6.8.2 Site sensitivity

Socio-economic sensitivities relate to the land uses that have economic value and also nearby sensitive receptors. All of the farms on which the proposed wind farm is to be situated are intensive, high production dairy cattle farms with cultivated pasture and fodder crops, the majority of which are under irrigation, but including non-irrigated “dry land” pastures as well. Some of the dairy farms also include a small percentage of beef cattle production.

Although no major tourism attractions are located on the site, the study area is in close proximity to several important tourism attractions, namely: 1) the resort town of Oyster Bay; 2) Baviaanskloof Wilderness Area; 3) Tsitsikamma National Park; and 4) Huisklip Nature Reserve (approximately 5 km from the wind farm site). In addition, the Jumanji and Thaba Manzi game farms are located to the north of the site, while the Oyster Bay Lodge is located south east of the site.

Other than farming enterprises, game farms (such as Jumanji and Thaba Manzi) and guest lodges (such as Oyster Bay Lodge), no other businesses were identified in the area based on desktop research.

The rural nature of the proposed site means that there are no community facilities (e.g. schools, clinics, etc.). The nearest such facilities are located in Humansdorp and Oyster Bay.

6.8.3 Impact assessment with mitigation

The identification of potential socio-economic impacts has been informed by a literature review (including those for similar studies), interviews with key stakeholders, projected capital and operational expenditure figures from

the developer as well as an agricultural case study by Lanz (2019). The predicted impacts listed below are detailed in the following tables:

- Temporary stimulation of the national and local economy;
- Temporary increase of new employment opportunities in the national and local economies;
- Contribution of skills development programmes in the country and local economy;
- Temporary increase in household earnings;
- Temporary increase in government revenue;
- Improvement of the livelihoods of the affected landowners
- Impact on property and land value in the immediately affected area;
- Negative changes to the sense of place (temporary and permanent);
- Temporary increase in social disruptions associated with the influx of people;
- Impact on economic and social infrastructure;
- Sustainable increase in production and GDP nationally and locally;
- Creation of sustainable employment positions nationally and locally
- Skills development of permanently employed workers
- Improved standard of living for benefiting households
- Sustainable increase in national and local government revenue;
- Provision of electricity for future development;
- Local economic and social development benefits derived from operations; and
- Improvement of the livelihoods of the household's dependant on the local agricultural sector.

Table 6.36: Construction and decommissioning impact: temporary stimulation of the national and local economy

Phase		**Construction**		**Decommissioning**
Impact description	It is expected that the national and local economy would be temporarily stimulated through construction related spending and additional spending by small, medium, micro enterprises (SMMEs) involved in the construction or decommissioning of the wind farm which would in turn result in an increase of national, provincial and local GDP. It is estimated that the construction of the project will increase the country's production by R2, 721.5 million in 2018 prices, which will translate into an additional R956.0 million of Gross Domestic Product per Region (GDP-R).			
	Without mitigation		**With mitigation**	
Nature	Positive		Positive	
Duration	Short term		Short term	
Extent	National		National	
Intensity	Very High		Very High	
Significance	**MODERATE (+)**		**MODERATE (+)**	
Probability	Almost certain / Highly probable		Almost certain / Highly probable	
Confidence	High		High	
Reversibility	High		High	
Resource irreplaceability	Low		Low	
Mitigation measures				
• The owner should encourage the main contractors to increase the local procurement practices and promote the employment of people from local communities, as far as feasible, to maximise the benefits to the local economies.				

- The owner should engage with local authorities and business organisations to investigate the possibility of procuring construction materials, goods and products from local suppliers where feasible.

Table 6.37: Construction and decommissioning impact: temporary increase of new employment opportunities in the national and local economies

Phase		Construction		Decommissioning
Impact description	During the construction and decommissioning phases, a number of direct (constructing of the wind farm) and indirect (created by SMMEs) temporary employment opportunities will be created nationally and locally. It is estimated that 180 direct, 1,138 indirect and 470 induced Full Time Equivalent (FTE)[11] positions will be created during construction			
	Without mitigation		**With mitigation**	
Nature	Positive		Positive	
Duration	Short term		Short term	
Extent	National		National	
Intensity	High		High	
Significance	**MODERATE (+)**		**MODERATE (+)**	
Probability	Almost certain / Highly probable		Almost certain / Highly probable	
Confidence	High		High	
Reversibility	High		High	
Resource irreplaceability	Low		Low	
Mitigation measures				
• Organise local community meetings to advise the local labour force about the project that is planned to be established and the jobs that can potentially be applied for. • Establish a local skills desk (in Humansdorp) to determine the potential skills that could be sourced in the area. • Recruit local labour as far as feasible. • Employment of labour-intensive methods in construction where feasible. • Sub-contract to local construction companies particularly SMME's and BBBEE compliant and women-owned enterprises where possible. • Use local suppliers where feasible and arrange with the local SMME's to provide transport, catering and other services to the construction crews.				

Table 6.38: Construction impact: contribution to skills development in the country and local economy

Phase		Construction		
Impact description	Skills development programmes undertaken by contractors would contribute to skills development in the national and local economy. Skills include both the turbine component assembly and tower manufacturing components in the Eastern Cape (transfer of knowledge from foreign experts) as well as construction on site. The majority of the unskilled labour, and some of the semi and skilled labour will be drawn from local communities (such as Humansdorp, Jeffreys Bay, St Francis, Oyster Bay and Clarkson/Kareedouw) and could apply the new skills to other proposed projects in the municipalities. There is also the potential for partnerships with NMU in relation to R&D and manufacturing.			

[11] FTE refers to the total number of hours worked by one employee on a full-time basis.

	Without mitigation	With mitigation
Nature	Positive	Positive
Duration	Permanent	Permanent
Extent	National	National
Intensity	High	High
Significance	**MINOR (+)**	**MODERATE (+)**
Probability	Probable	Almost certain / Highly probable
Confidence	High	High
Reversibility	High	High
Resource irreplaceability	Low	Low
Mitigation measures		
• Facilitate knowledge and skills transfer between foreign technical experts and South African professionals during the pre-construction and construction phases. • Set up apprenticeship programmes to build onto existing skill levels or develop new skills amongst construction workers especially those from local communities.		

Table 6.39: Construction and decommissioning impact: temporary increase in household earnings

Phase	**Construction**	**Decommissioning**
Impact description	The proposed wind farm will create a total of 1,788 FTE employment positions during construction generating about R1,551.8 million of revenue for the affected households in the country through direct, indirect and induced effects depending on route selection. Of this figure about R106.1 million will be paid out in the form of salaries and wages to those individuals directly employed during the construction phase. The remaining values of about R1,445.7 million in households' earnings will be generated through indirect and induced effects resulting from project expenditure. Although temporary, this increase in household earnings will have a positive effect on the standard of living within these households. This increase in household income however will varying significantly based on the respective skill levels and job specifications of the employee.	
	Without mitigation	**With mitigation**
Nature	Positive	Positive
Duration	Medium term	Medium term
Extent	National	National
Intensity	Moderate	Moderate
Significance	**MINOR (+)**	**MINOR (+)**
Probability	Probable	Probable
Confidence	High	High
Reversibility	High	High
Resource irreplaceability	Low	Low
Mitigation measures		
• Recruit local labour as far as feasible to increase the benefits to the local households. • Employ labour intensive methods in construction where feasible. • Sub-contract to local construction companies where possible.		

• Use local suppliers where feasible and arrange with local SMME's and BBBEE compliant and women-owned enterprises to provide transport, catering and other services to the construction crews.

Table 6.40: Construction and decommissioning impact: temporary increase in government revenue

Phase	Construction	Decommissioning
Impact description	The construction and decommissioning of the proposed wind farm would generate revenue for the government during the construction period through a combination of personal income tax, VAT, companies tax, etc. Additional government revenue will also be earned through corporate income tax. Government earnings will be distributed by national government to cover public spending which includes amongst others the provision and maintenance of transport infrastructure, health and education services as well as other public goods.	
	Without mitigation	**With mitigation**
Nature	Positive	Positive
Duration	Short term	Short term
Extent	National	National
Intensity	Low	Low
Significance	**MINOR (+)**	**MINOR (+)**
Probability	Almost certain / Highly probable	Almost certain / Highly probable
Confidence	Medium	Medium
Reversibility	High	High
Resource irreplaceability	Low	Low
Mitigation measures		
• No mitigation required.		

Table 6.41: Construction impact: impact on property and land value in the immediately affected area

Phase	Construction	
Impact description	The literature review, anecdotal evidence from estate agents and the agricultural case study (Lanz, 2019) suggests that given the rural nature of the area where the wind farm will be developed, property prices will either not be affected, or will experience a slight increase in value due to the perceived additional turbine placement revenue that farms in close proximity to the project area could possibly receive in the future given that the area is seen as being a good area for wind farm development.	
	Without mitigation	**With mitigation**
Nature	Positive	Negative
Duration	Long term	Long term
Extent	Local	Local
Intensity	Low	Low
Significance	**NEGLIGIBLE (+)**	**NEGLIGIBLE (+)**
Probability	Unlikely	Unlikely
Confidence	High	High

Reversibility	Low	Low
Resource irreplaceability	Medium	Medium
Mitigation measures		
• The mitigation measures proposed by the visual specialists should be adhered to. • Efforts should also be made to avoid disturbing such no-go sites during construction.		

Table 6.42: Construction impacts: changes to the sense of place

Phase		**Construction**		
Impact description	It is anticipated that increased visual and noise disturbances during the construction phase would change the area's natural setting and therefore sense of place (as detailed in Section 6.11and Section 6.12). Sense of place is a subjective matter depending on the receptor's perceptions. The area is rural but has already been affected by the development of the existing operational wind farms. Temporary disturbance begins at the construction phase but as the wind farm becomes operational, some of these will last. Most notably the visual impact of the turbines.			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term		Short term	
Extent	Limited		Limited	
Intensity	High		Moderate	
Significance	**MINOR (-)**		**MINOR (-)**	
Probability	Almost certain / Highly probable		Almost certain / Highly probable	
Confidence	Medium		Medium	
Reversibility	High		High	
Resource irreplaceability	Low		Low	
Mitigation measures				
• Implement mitigation measures proposed by the visual and noise specialists. • Avoid disturbing natural areas during construction.				

Table 6.43: Construction and decommissioning impact: temporary increase in social disruptions associated with the influx of people

Phase		**Construction**		**Decommissioning**
Impact description	The influx of construction workers into the area could result in social disruptions between the local population, existing construction workers currently operating in the area and this new workforce. These could disrupt existing family structures and social networks through a potential temporary increase in the level of petty crime, illicit activity, alcohol and drugs, unplanned pregnancies and possibly a deterioration of the health of the local community through the spread of communicable diseases (e.g. flu, TB, sexually transmitted diseases (STDs) including HIV and/or AIDS).			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	

Duration	Short term	Short term
Extent	Local	Local
Intensity	Low	Low
Significance	**MINOR (-)**	**NEGLIGIBLE (-)**
Probability	Almost certain / Highly probable	Rare / Improbable
Confidence	High	High
Reversibility	High	High
Resource irreplaceability	Low	Low
Mitigation measures		

- Ensure a community liaison officer is active in the nearby towns and ensure adherence to strict labour recruitment practices that would reduce the desire of potential job seekers to loiter around the properties in the hope of finding temporary employment.
- Control the movement of workers between the site and areas of residence to minimise loitering around the facility. This should be achieved through the provision of scheduled transportation services between the construction site and area of residence.
- Employ locals as far as feasible through the creation of a local skills database.
- The owner in consultation with the appointed contractor/s should implement an HIV/AIDS/TB awareness programme for all construction workers at the outset of the construction phase.
- The contractor/s should develop and implement a code of conduct for behaviours for all workers on site. Ensure that any damages or losses to nearby affected farms that can be linked to the conduct of construction workers are adequately reimbursed.
- Assign a dedicated person to deal with complaints and concerns of affected parties.

Table 6.44: Construction and decommissioning impact: impact on economic and social infrastructure

Phase	**Construction**	**Decommissioning**
Impact description	The wind farm is anticipated to directly create 180 FTE person years during construction which, given the duration of the project, is anticipated to equate to having a large number of people on site. It is estimated that a notable portion of these construction workers will be coming from outside the direct local economy and from other parts of the Kouga Local Municipality. Given that these migrant workers will require accommodation and other services there is likely to be an increase in the demand for rental accommodation and social services (such as health facilities) and impact on road conditions (only if unmitigated, as discussed in Section 6.13). These impacts can however be mitigated if the developer engages with the local municipality and plans accordingly.	
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Duration	Short term	Short term
Extent	Municipal area	Municipal area
Intensity	Low	Negligible
Significance	**MINOR (-)**	**NEGLIGIBLE (-)**
Probability	Almost certain / Highly probable	Probable
Confidence	Medium	Medium
Reversibility	High	High

Resource irreplaceability	Low	Low
Mitigation measures		
• Provide adequate signage along routes to warn the motorists of the construction activities taking place on the site. • Engage with relevant local authorities (and provincial if necessary) and inform them of the development as well as discuss with them their ability to meet the additional demands on social and basic services created by the in-migration of workers. • Where feasible, assist the municipality in ensuring that the quality of the local social and economic infrastructure does not deteriorate through the use of social responsibility allocations. • Make contributions to the maintenance of the road network as proposed by the traffic specialist.		

Table 6.45: Operational impact: sustainable increase in production and GDP nationally and locally

Phase			**Operational**	
Impact description	It is estimated that the project will directly generate R6.7 million of value add per annum, over the lifespan of the facility. Through indirect and induced effects, an additional R5.3 million of GDP-R will be generated per annum, which means that the total impact of the project on the national GDP-R will equate to R12 million per annum in 2018 prices. Aside from the utilities sector, industries that will experience the greatest stimulus from the project will include electrical machinery and apparatus, insurance, and transport service.			
	Without mitigation		**With mitigation**	
Nature	Positive		Positive	
Duration	On-going		On-going	
Extent	National		National	
Intensity	Moderate		Moderate	
Significance	**MODERATE (+)**		**MODERATE (+)**	
Probability	Almost certain / Highly probable		Almost certain / Highly probable	
Confidence	High		High	
Reversibility	High		High	
Resource irreplaceability	Low		Low	
Mitigation measures				
• The operator of the wind energy facility should be encouraged to, as far as possible, procure materials, goods and products required for the operation of the facility from local suppliers to increase the positive impact in the local economy.				

Table 6.46: Operational impact: creation of sustainable employment positions nationally and locally

Phase			**Operational**	
Impact description	The ongoing maintenance and monitoring of the wind farm will directly create an estimated 20 FTE employment position all of which will be retained for the lifespan of the wind farm. Aside from the direct employment opportunities, the wind farm will support a further estimated 52 FTE employment positions created through the production and consumption induced effects. Due to the spatial allocation of procurement spending and direct			

	employment created, most of the indirect and induced positions will also be created outside of the local area.	
	Without mitigation	**With mitigation**
Nature	Positive	Positive
Duration	On-going	On-going
Extent	National	National
Intensity	Moderate	Moderate
Significance	**MODERATE (+)**	**MODERATE (+)**
Probability	Almost certain / Highly probable	Almost certain / Highly probable
Confidence	High	High
Reversibility	High	High
Resource irreplaceability	Low	Low
Mitigation measures		
• Where possible, local labour should be considered for employment so as to increase the positive impact on the local economy • As far as possible, local SMMEs should be approached to investigate the opportunities for supply inputs required for the maintenance and operation of the facility.		

Table 6.47: Operational impact: skills development of permanently employed workers

Phase			**Operational**	
Impact description	South Africa has a limited number of large-scale wind energy facilities and the industry is still in its infancy, thus the skills base to operate and maintain such facilities is not always readily available. It is likely that highly skilled personnel would need to be recruited from outside of the Kouga Local Municipality. These employees would include skilled "mechatronics" engineers (specialised in both electrical and mechanical engineering) likely to be recruited from the NMBM and trained by the manufacturer, as well as less skilled services such as safety and security and mechatronic assistants. Maintenance will be carried out throughout the lifetime of the turbines; typical activities include changing of oil, replacement of brake lining and cleaning of components.			
	Without mitigation		**With mitigation**	
Nature	Positive		Positive	
Duration	Permanent		Permanent	
Extent	Municipal area		Municipal area	
Intensity	Moderate		Moderate	
Significance	**MODERATE (+)**		**MODERATE (+)**	
Probability	Almost certain / Highly probable		Certain / definite	
Confidence	High		High	
Reversibility	High		High	
Resource irreplaceability	Low		Low	

Mitigation measures
• The wind farm owner should consider establishing vocational training programmes and/or bursary schemes for the local labour force to promote the development of skills required by the wind energy facility. This would initially permit people to be employed by the development and, in the future, at other similar facilities elsewhere.

Table 6.48: Operational impact: improved standard of living for benefiting households

Phase			Operational	
Impact description	The creation of 72 FTE employment positions throughout the country will generate an estimated R19.8 million of additional personal income (2018 prices), which will be sustained for the entire duration of the wind farm's lifespan. Given the average household size in affected local municipalities and nationally, this increase in household earnings will support up to 254 additional people across the country. The sustainable income generated as a result of the project's operation will positively affect the standard of living of all benefiting households.			
	Without mitigation		**With mitigation**	
Nature	Positive		Positive	
Duration	On-going		On-going	
Extent	National		National	
Intensity	Moderate		Moderate	
Significance	**MINOR (+)**		**MINOR (+)**	
Probability	Probable		Probable	
Confidence	Medium		Medium	
Reversibility	High		High	
Resource irreplaceability	Low		Low	
Mitigation measures				
• Where possible, the local labour supply should be considered for employment opportunities to increase the positive impact on the area's economy. • As far as feasible, local small and medium enterprises should be approached to investigate the opportunities for supply inputs required for the maintenance and operation of the facility.				

Table 6.49: Operational impact: sustainable increase in national and local government revenue

Phase			Operational	
Impact description	The proposed wind farm will, through salaries and wages payments, contribute towards both local and national government revenue. This will occur at a national level with the revenue derived from the payment of salaries and wages to permanent employees involved with the maintenance of the wind farm will contribute to the national fiscus. Although it is impossible to trace exactly how such revenue is allocated, any additional revenue generated means that national governments can increase its spending on public goods and services.			
	Without mitigation		**With mitigation**	
Nature	Positive		Positive	
Duration	On-going		On-going	

Extent	National	National
Intensity	Low	Low
Significance	**MODERATE (+)**	**MODERATE (+)**
Probability	Almost certain / Highly probable	Almost certain / Highly probable
Confidence	Medium	Medium
Reversibility	High	High
Resource irreplaceability	Low	Low
Mitigation measures		
• No mitigation required.		

Table 6.50: Operational impact: provision of electricity for future development

Phase			**Operational**	
Impact description	The increasing of the electricity supply will benefit both residents and businesses owners across South Africa including in the Kouga Local Municipality. The associated infrastructure linked to the wind farm will also enhance the reliability of the current supply, and could permit residences and businesses to have additional access to electricity. The wind farm coupled with its associated infrastructure will help to unlock further development in South Africa and to a lesser extent in both the Kouga and Koukamma Local Municipalities.			
	Without mitigation		**With mitigation**	
Nature	Positive		Positive	
Duration	On-going		On-going	
Extent	National		National	
Intensity	Moderate		Moderate	
Significance	**MODERATE (+)**		**MODERATE (+)**	
Probability	Almost certain / Highly probable		Almost certain / Highly probable	
Confidence	High		High	
Reversibility	High		High	
Resource irreplaceability	Low		Low	
Mitigation measures				
• No mitigation required.				

Table 6.51: Operational impact: local economic and social development benefits derived from operations

Phase			**Operational**	
Impact description	The proposed wind farm will make a notable contribution to economic and social and community development in the area. Communities living close to the project (typically within a 50 km radius of the wind farm) will benefit from the existence of the project over the 20-year life span as Government requires these projects to engage with the social and economic needs of these local communities. Policy requires that the project must invest a percentage of its total project revenue into socio-economic development initiatives and			

	enterprise development programmes identified within the project's sphere of influence. The REI4P to date has had very strict requirements for a percentage of revenue to be invested by the wind farms in these communities. For example, the Kouga Wind Farm has spent over R12 million so far within the local communities from 2015 to 2018 and it will be spending around R800 million in the local communities around it in its 20-year life span which will have a significant positive impact. Other examples of initiatives funded by the wind farms in the area are off-road vehicles for the St Francis Hospice, a rebuild of a fire-devastated crèche in Humansdorp, a computer laboratory with 25 solar-powered computers for a local primary school, and a R4 million library requested by a local community (which also created jobs for 18 locals during construction). Furthermore, the wind farms have funded emerging farmers such as the Kruisfontein Emerging Cattle Farmers Cooperative and the Sarah Baartman Honey Bee Trust (SBHBT), helped in the funding of mobile clinics and BBEEE business-skills training enterprises, funded the training of Early Childhood Development (ECD) Practitioner in the area, etc. They also rolled out a series of workshops for woman in the communities on finances, health and nutrition, exercise, personal development and parenting as well as other interventions in the local communities along with scholarship/ internship programmes.	
	Without mitigation	**With mitigation**
Nature	Positive	Positive
Duration	On-going	On-going
Extent	Municipal area	Municipal area
Intensity	High	High
Significance	**MODERATE (+)**	**MODERATE (+)**
Probability	Almost certain / Highly probable	Certain / definite
Confidence	High	High
Reversibility	High	High
Resource irreplaceability	Low	Low
Mitigation measures		
• Enterprise Development and Socio-economic Development initiatives outlined in the REI4P bid must be effectively implemented. • These plans should be reviewed on an annual basis and, where necessary, updated. • When identifying enterprise development initiatives, the focus should be on creating sustainable and self-sufficient enterprises. • In devising the programmes to be implemented through these allocations, the developer should take into account the local IDPs.		

Table 6.52: Operational impact: improvement of the livelihoods of the households dependant on the local agricultural sector

Phase			**Operational**	
Impact description	Income earned by farmers from the turbines on their land will improve the individual farmers revenue streams. This will place them in a better position to further invest in their farms. Such additional investment could motivate farmers to expand their operations and thus employ additional workers and/or increase their salary/wage bill. These increases would in turn, improve the livelihoods of both farm workers and farmers. This is supported by the case study by Lanz (2019) where it was concluded that it is likely, that the positive impacts of wind farming, particularly increased financial security, have outweighed the negative impacts and that wind farming has benefited agriculture and agricultural			

	production in the area. There is one particular example in the areas whereas farmer has been able to take up farming full time through access to this financial security.	
	Without mitigation	**With mitigation**
Nature	Positive	Positive
Duration	On-going	On-going
Extent	Local	Local
Intensity	High	High
Significance	**MODERATE (+)**	**MODERATE (+)**
Probability	Almost certain / Highly probable	Almost certain / Highly probable
Confidence	Medium	Medium
Reversibility	Low	Low
Resource irreplaceability	Low	Low
Mitigation measures		
• No mitigation required.		

Table 6.53: Operational impact: negative changes to the sense of place

Phase			**Operational**	
Impact description	The effects on the community's sense of place will initially be felt during the construction period and will continue into the operational phase. The assessment of the negative change in the sense of place provided for the construction phase will be almost identical to that of the operational phase, refer to Table 6.42.			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	On-going		On-going	
Extent	Local		Local	
Intensity	Negligible		Negligible	
Significance	**NEGLIGIBLE (-)**		**NEGLIGIBLE (-)**	
Probability	Unlikely		Rare / improbable	
Confidence	High		High	
Reversibility	Medium		Medium	
Resource irreplaceability	Low		Low	
Mitigation measures				
• The mitigation measures proposed by the visual and noise specialists should be adhered to. • Efforts should also be made to avoid disturbing such sites during operations.				

6.8.4 No-Go alternative

The No-Go alternative implies that the socio-economic profile of the Kouga Local Municipality would remain unchanged. For this reason, the anticipated impact is rated as neutral. However, should the Impofu West Wind

Farm not be developed, the potential job opportunities, and associated improvement in livelihoods, that could be created are forgone, as well as improvements in national energy supply.

6.8.5 Conclusion and recommendations

Urban-Econ concludes that the net socio-economic effect of the wind farm, indicates that the project would generate greater socio-economic benefits during both the construction and operational phases than the potential losses that could occur as a result of its establishment. Stimulation of production, employment, government revenue, skills development and household income as a result of the investment in the project and its subsequent operations will outweigh possible production, employment and household income losses that could potentially be experienced by local businesses affected by changes in the areas aesthetic and visual resources. Adherence to the proposed mitigation measures however would ensure that the offset of impacts is more balanced and that it also takes into account communities and businesses that will be negatively affected.

The positive effects generated by the project will not entirely offset all the negative impacts. These include impacts on the sense of place and property and business values that could occur during both construction and operation. These impacts though will affect local communities either temporarily or over the long term. These impacts are not highly significant and can be traded off for the net positive impact created by the project in terms of production, employment, government revenue, community benefits and households' earnings. This means that when compared with the no-go option, the proposed project is associated with greater socio-economic benefits.

6.9 Palaeontology

The information included in this section is drawn from the Palaeontological Specialist Report attached as Appendix E7, undertaken by Dr. John Almond from Natura Viva (Almond, 2018). Note that palaeontological impacts were scoped out of the EIA Phase as described in Section 4. However, the Scoping level information has been included for context and to motivate why impacts have not been assessed in detail.

6.9.1 Baseline description

Palaeontological resources include fossilised materials such as buried fossils and rock units. Since some potential palaeontological material is buried, it is often only found during the construction phase of a project.

According to Almond (2018), the project falls within the southern coastal platform in the Kouga region near Oyster Bay, Eastern Cape, overlapping with the south-eastern end of the Kareedouwberge range of the Cape Fold Belt. The area is characterised by Ordovician to Early Devonian sediments of the Table Mountain Group and Bokkeveld Group, refer to Table 6.54 and Figure 6.24. These marine to continental Palaeozoic bedrocks are assigned to the Peninsula, Cederberg, Goudini, Skurweberg, Baviaanskloof and Gydo Formations of the Cape Supergroup. The site is located on a coastal platform with a gently-sloping topography. The environmental features of the site points to a dynamic landscape of river and stream banks, erosion gullies, borrow pits and quarries, road and railway cuttings and farm dams.

In terms of palaeontology, most of the pertinent rock units are only sparsely fossiliferous to unfossiliferous. These rock units are normally widely dispersed. Scientifically important fossil assemblages have been recorded from the Cederberg and Baviaanskloof Formations of the Table Mountain Group as well as the Gydo Formation at the base of the Bokkeveld Group in the broader Cape region. High levels of tectonic deformation as well as chemical weathering have compromised the palaeontological features within the study area. All of the sedimentary formations represented within the study area contain fossils or traces of fossils. A site inspection revealed low palaeontological sensitivity within the site. The most important fossil groups recorded within the site are fossils in the Table Mountain Group, fossils in the Bokkeveld Group and fossils in the Algoa Group.

A range of shallow marine to nearshore fluvial and estuarine trace fossils have been recognised to occur in the Peninsula Formation, and identified mainly from the Western Cape outcrop area. The palaeontologist identified marine trace fossils in the uppermost Peninsula Formation in an existing quarry near Rosenhof farmstead in the Impofu West Wind Farm site. No additional body or trace fossils were observed within the Table Mountain Group

rocks within the Impofu Wind Farms study area. Apart from low exposure levels, this can be attributed to high levels of bedrock weathering underlying the coastal platform.

The palaeontological investigation recorded shelly marine invertebrates and traces (burrows etc), together with rare fish remains, primitive vascular plants (probably mis-assigned to this stratigraphic unit), trace fossils (burrows, borings etc) and microfossils as the most important fossil groups from the lower Bokkeveld Group. The mudrock dominated lower Bokkeveld Group sediment within the study area is poorly exposed, and where visible (i.e. in road cuttings) are deeply weathered and cut. Based on the palaeontological study the potential of significant Bokkeveld fossil material being maintained under these conditions is very low.

The sparsely distributed palaeontological record of the Algoa Group consists mainly of fragmentary marine shells, foraminifera and a small range of terrestrial snails. Dense arrays of calcretised rhizoliths (root casts) commonly occur in these and contemporary Plio-Pleistocene aeolianites along the southern and southwestern coast. Based on the palaeontological investigation, a few, highly-weathered examples of possible subterranean termite nests were recorded within ferruginous colluvial gravels overlying weathered Peninsula Formation bedrocks. These fossil traces are not regarded as high conservation significance.

Table 6.54: Main geological units in the study area (Toerien and Hill, 1989)

Group	Formation
Table Mountain Group (Ordovician to Early Devonian)	Peninsula Formation (Op, middle blue) Cedarberg Formation (Oc, grey) Goudini Formation (Og, grey-green) Skurweberg Formation (Ss, pale blue) Baviaanskloof Formation (S-Db, dark blue)
Bokkeveld Group (Early Devonian)	Gydo Formation (Dg, v. pale blue)
Algoa Group (Late Caenozoic, Pliocene / Quaternary to Recent)	Nanaga Formation (T-Qn, orange-brown) – N.B. outcrop area is underestimated on map; unmapped relict patches of this formation are present within the present study area.

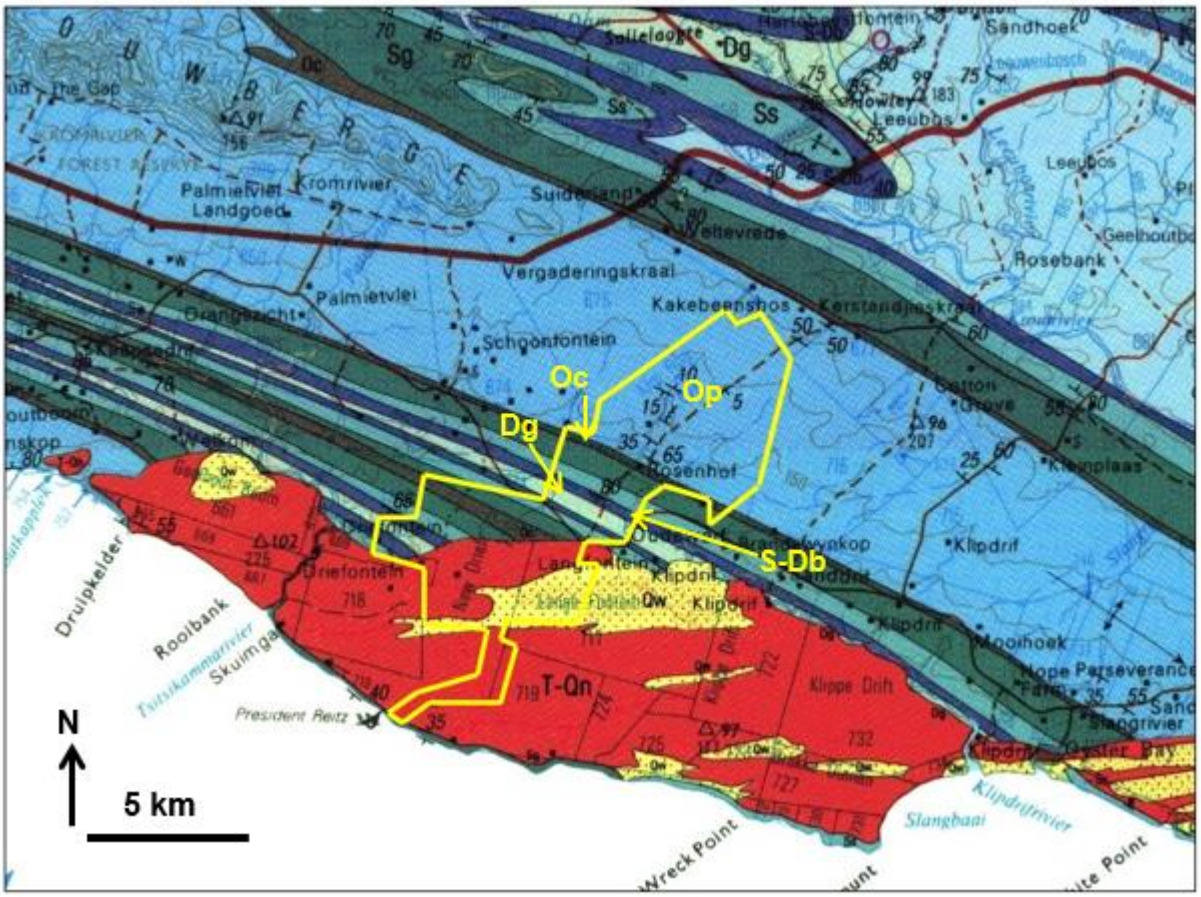


Figure 6.24: Extract from 1: 250,000 geology sheet 3324 Port Elizabeth (Council for Geoscience, Pretoria). The main geological units represented within the study area are listed in Table 6.54

6.9.2 Site sensitivity

Palaeontological sensitivity is directly related to the capability to preserve palaeontological heritage resources. The relevant palaeontological study indicates that the palaeontological sensitivity of the Humansdorp region is generally low as far as the bedrocks are concerned, especially because of the high levels of chemical weathering and tectonic deformation observed within the area. Two quarry sites of geoheritage / palaeontological interest were identified by the palaeontologist near the Rosenhof farmstead (within the Impofu West site boundary). However, the two quarry sites will not be directly impacted by the proposed wind farm development. The sites show traces of equivocal fossils which are not regarded as of high conservation significance and will not be impacted by the development footprint. Apart from the trace fossil site in one of these existing quarries, near Rosenhof farmstead, no significant fossil sites were recorded during the field survey of the Impofu West Wind Farm project area and the overall palaeontological sensitivity of the area is rated as low.

6.9.3 Potential impacts and mitigation

The predicted palaeontological impacts that could potentially result from the proposed construction of the proposed Impofu West Wind Farm and associated infrastructure were specifically in relation to disturbance and damage of fossil heritage. The anticipated palaeontological impacts are likely to occur during the construction phase of the proposed development, as some potential fossil heritage material is buried. The placement of turbines and associated infrastructure could result in the loss of fossil heritage. During construction disturbance, damage and destruction of fossils preserved at the surface or below ground is likely to occur as a consequence of clearance, earthworks and excavations for construction activities which include wind turbine foundations, underground cabling and access roads. The predicted impact is of negligible negative significance and can be

mitigated by the recording and sampling of significant fossils by a professional palaeontologist and safeguarding and reporting any potential fossil finds to the ECPHRA.

6.9.4 No-Go alternative

The No-Go alternative anticipates changes to the paleontological environment that would occur in the absence of the proposed development. In this scenario, natural weathering processes and erosion will continue to steadily destroy fossils preserved near or at the ground surface, but at the same time new fossils will be continually exposed. Therefore, the anticipated impact of the No-Go scenario on the environment from a paleontological perspective is neutral.

6.9.5 Conclusion and recommendations

The focus of the palaeontological investigation was to determine, assess or predict the diversity, density and distribution of fossils within and beneath the study area, as well as their heritage or scientific interest. The potential impacts during the construction phase, with mitigation, are considered of a negligible negative significance on the palaeontology on site, as well as, on the regional context. The study has found that there are no significant palaeontological resources present on site, and the overall palaeontological sensitivity of the area is rated as low.

The primary negative impact involves the disturbance, damage or destruction of fossil material within the development footprint during the construction phase. Due to the absence of well preserved, unique and significant fossil resources on site, the predicted impact on fossil heritage is of negligible negative significance. Pending the potential discovery of significant new fossil remains (e.g. vertebrate bones and teeth, horn cores, shells, trace fossils, plant compressions) during the construction phase of the project development, no further specialist palaeontological studies or mitigation are recommended for this project in the EIA and construction phases.

6.10 Archaeology

The information included in this section is drawn from the Phase 1a Archaeological Impact Assessment (AIA) Report attached as Appendix E8 compiled by Dr Peter Nilssen (Nilssen, 2019). The proposed development triggers Section 38 of the National Heritage Resources Act (25 of 1999; NHRA) and the AIA will ensure compliance with the heritage legislation. The cultural landscape is also considered in the AIA.

6.10.1 Baseline description

Based on previous studies undertaken in the surrounding environment, it is known that the area contains heritage resources including a variety of historic period structures, associated cultural materials, graves and grave yards. Heritage resources of the prehistoric period, particularly in the areas further than 5 km inland from the present-day shoreline, are most commonly represented by Early Stone Age (ESA) and Middle Stone Age (MSA) stone artefacts in open contexts. Nilssen (2019) consulted various heritage studies (refer to Appendix E8 for the complete list of references) conducted for various projects in the broader area. One important one is a comprehensive desktop study undertaken by Binneman and Reichert (2017) that summarised the relevant findings from the heritage studies for all the renewable projects and other infrastructure projects in the area. In their report, Binneman and Reichert (2017) reported the following regarding the Impofu West site:

> *"The desktop study identified only a few locations (all north of the southern boundary of the WEF) where Early and Middle Stone Age stone tools were observed. These stone tools were found randomly scattered without any recognised distribution patterns. They were in secondary context and not associated with any other archaeological materials, and therefore are of low cultural significance. Most of the area is also already disturbed by farming activities. Based on our experiences and knowledge gained from other investigations in the immediate area and the wider surrounding region, it would appear that the area in general is of low cultural sensitivity and it is unlikely that any in situ archaeological remains will be exposed during the development.*

There are, however, areas of concern with regard to the southern area of the proposed footprint ... These areas fall roughly within, what we would call the 'sensitive coastal archaeological zone', and needs to be carefully managed to limit the impact on archaeological resources and the cultural landscape. Ideally, we would like to recommend that no development takes place in these areas. There are small 'undisturbed' dune areas covered by coastal fynbos vegetation to the west of Oyster Bay and preferably these areas must be avoided as there is a high possibility that in situ archaeological sites/materials will be damaged/destroyed (See Figure 5 and KMZ file). These areas were also assessed as part of a Heritage Impact Assessment for one of the alternatives for the Gibson Bay grid connection. The heritage specialist did not favour the construction of the grid connection in the undisturbed areas and recommended another alternative (Nielsen 2014). We therefore recommend that the development within the footprint be limited to previously disturbed areas, providing that all activities are closely monitored at all times and that specialist recommendations must be followed regarding any heritage finds.

A further concern is the far south-western corner of the proposed WEF which borders on the Tsitsikamma River and adjacent Geelhoutboom dune area. The world renowned Klasies River Caves are some 5 km to the west. We regard the Geelhoutboom dune system as part of the western extension of the cultural landscape which stretches from the Klasies River in the west to the Krom River in the east. The Geelhoutboom archaeological landscape has been described by Prof. H.J. Deacon as of spectacular proportions and the largest artefact scatter observed along the southern Cape coast. There is a red no go zone of almost one kilometre along the Tsitsikamma River and it is recommended that no turbines are place within this zone to keep the visual impact on this part of the cultural landscape as low as possible" (Binneman and Reichert 2017, pages 17 and 18)".

The current development proposal has proactively excluded two large areas of potentially developable land from the wind farm project as well as the one kilometre long stretch immediately east of the Tsitsikamma River as described above in the excerpt. Refer to Figure 6.27 and Figure 6.28 which illustrate these No-Go areas.

6.10.1.1 Pre-colonial / Stone Age period

Several heritage related studies have been conducted along the nearby coastline and has shown the greater area to be rich in archaeological resources of Early, Middle and Later Stone Age (LSA) origin. ESA materials typically include Acheulian hand axes, cleavers and chopping tools that date from between approximately 1.5 million and 300,000 years ago and is the earliest evidence of human ancestors occupying this area. A large scatter comprising thousands of ESA and MSA stone artefacts was identified in previously ploughed and disturbed sediments to the north of the Impofu Wind Farms site, but this ESA site will not be affected by the proposed Impofu Wind Farms development. Below is an example of *in situ* ESA artefacts in ancient aeolian deposits found at a quarry located within the proposed Impofu West site (IW7). The stone artefacts are bedded in Plio-Pleistocene aged Nanaga aeolianites (from about 5 million to 12,000 years old) that were exposed as a result of recent quarrying activities (Almond, 2017) (Figure 6.25). This quarry is avoided in the latest Impofu West Wind Farm development design, and therefore these heritage resources are no longer threatened and are preserved.

Figure 6.25: Encircled in white are in situ stone artefacts bedded in ferricretised aeolian sands; the photo on the right is a typical crude bifacial early stone age hand axe in quartzite

Artefacts from the MSA (in this area 250 to 30 thousand years ago) are characterised by flake and blade industries and carries evidence for core preparation on prepared or faceted striking platforms of points, flakes and blades (Figure 6.26). The Klasies River Cave Complex is located approximately 8 km west of the Impofu Wind Farms boundary and contains evidence of human occupation for the last 120,000 years (refer to Klasies River on Figure 6.27). Another significant MSA site in the greater area also shown on Figure 6.27 is the Brandewynkop dunes. The Klasies River Cave Complex and Brandewynkop will likely not be impacted by the proposed Impofu West Wind Farm as they are not included in the greater wind farm footprint.

Figure 6.26: Example of flaked quartzite (left) and stone age flake (right) at the Impofu West site

Substantial technological improvements over the MSA era characterise the LSA in this area. This includes amongst others wide spread occurrence of rock art, decorative objects, human burials with grave goods including painted stones, expanded stone tool kit, bone tools, ostrich shell containers etc. Many of the LSA sites in the area are shell middens, and although these usually occur within a few hundred metres of the shoreline, they are also found up to 5 km inland.

A number of LSA sites occurring in the dune systems along the 5 km strip and their contents have been identified and described for the greater area. No significant LSA sites have, however, been recorded by previous studies in the immediate vicinity of the present study area.

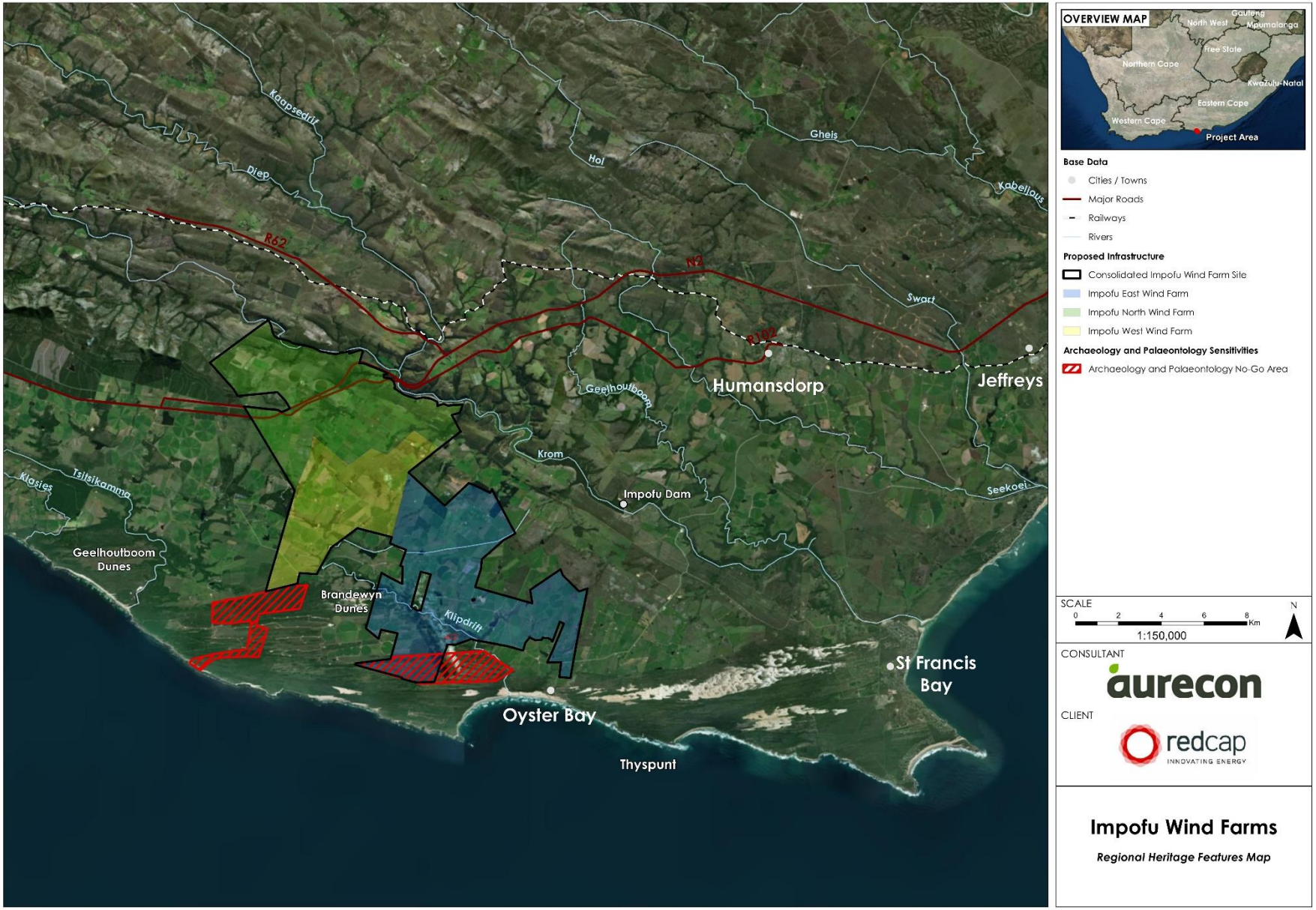


Figure 6.27: Regional heritage features

6.10.1.2 Pastoralist / herder period

Approximately 1,800 years ago KhoiKhoi peoples settled in the area and brought with them a significant shift in the socio-economic setting of the area. The most common archaeological traces of the pastoralist / herder lifestyle in the area include large stone features associated with cooking, shell middens with pottery only and shell middens with pottery and domesticated animals.

The KhoiKhoi were the first food producing peoples in South Africa who brought domestic stock, pottery / ceramic containers and bowls and associated cultural items into the region. A lifestyle still closely connected with nature would have allowed for likely easy and mutually beneficial relations between KhoiKhoi and hunter-gatherer (San) peoples. Descendants of these first farming peoples, and offspring from converging KhoiKhoi and San families, such as members of the Gamtkwa Khoisan Council, still live in the region today.

6.10.1.3 Colonial / historic period

The colonial period settlers are mostly of European origin and started settling in the area in the 1700's. With large scale cattle farming (mostly dairy) as well as clearing natural landscapes for pastures and croplands, these settlers have had the most dramatic effect on the environment.

Heritage resources of this period include dwellings and associated structures and material culture as well as cemeteries, marked and unmarked human burials older than 60 years or of historic significance.

6.10.1.4 Cultural landscape

The term 'cultural landscape' constitutes the imprinting of human behaviour on the environment, and the relationship between people and the landscape. Nomadic hunter-gatherers and to a lesser extent early pastoralist lifestyles of pre-historic inhabitants leaves little to no physical evidence of their presence in the landscape and has a negligible modifying effect on the landscape. This is in stark contrast to the impact that the past few hundreds of years of colonial agriculture has had on the landscape.

The value of cultural landscapes is mainly determined through professional interpretation (academic) and opinion, community and public values as well as environmental and heritage legislation. This cultural landscape is defined and informed through, amongst others, natural landscape features, palaeontology, archaeology / anthropology, oral histories and public memory. The cultural landscape of the greater study area comprises of three broad layers:

- 1st Layer: Most recent colonial settlement and development resulting in the most visually modifying effect on the landscape. Impacts / features related to this cultural layer includes: roads, single vehicle tracks, agricultural clearings for grazing and cultivation, variety of farming activities, variety of farmsteads, structures etc.
- 2nd Layer: Pastoralist or herder period dating to the last 2,000 years.
- 3rd Layer: The three stone age periods (described above) dating between a few hundred years ago to 1.5 million years ago.

Although the prehistoric cultural landscape is the least evident and often invisible, temporally, it makes up for the overwhelming bulk of human occupation of the region. It can thus be argued that the most significant cultural layer in this area involves the pre-colonial cultural landscape and its sense of place. The cultural landscape of the greater area comprises the 5 km wide strip along the coast from St. Francis Bay to Klasies River, refer to Figure 6.27. Thyspunt has also been recognised as a site of cultural significance and the SAHRA will not approve developments that have a negative impact on the Thyspunt area.

The most recent layer of the cultural landscape is made up of the existing Kouga, Gibson Bay, Tsitsikamma Community and Jeffery's Bay Wind Farms and associated power lines.

6.10.2 Site sensitivity

Parts of the southern portion of the Impofu West Wind Farm site is situated in the archaeologically sensitive coastal zone, also referred to as a pre-colonial cultural landscape. The previously undisturbed and

archaeologically sensitive area west of Brandewynkop and stretching down to the shoreline in the south was identified as a No-Go zone and has been excluded by the development footprint. In addition, the proposed development is more than 2.5 km from the Tsitsikamma River and excludes the area immediately east of the Tsitsikamma River. The proactive exclusion of wind farm development activities from these areas has helped to reduce the impact on the pre-colonial cultural landscape. Most of the area covered by the proposed wind farm development is more than 5 km from the present day shoreline and thus lies inland of the archaeologically sensitive coastal zone and pre-colonial cultural landscape.

Archaeological site surveys were undertaken in September 2017 and between 28 March 2018 and 4 April 2018 by Nilssen (2018). Archaeological resources identified at the study area are shown on Figure 6.28. These archaeological resources include:

These archaeological resources include:

- Low density scatter of ESA origin, including a crude bifacial hand axe or core, a large piece of flaked quartzite, large flakes and a large hammer stone (IW1) – these artefacts are avoided by the current development footprint;
- Low density scatter of stone artefacts dominated by specimens of MSA age, including examples of flaking or quarrying of quartzite outcrops (IW2) - these artefacts are avoided by the current development footprint;
- Stone Age quarry site situated about 250 m north west of find IW2. This locality consists of quartzite outcrops with numerous flake scars indicative of Stone Age people extracting pieces of stone from the outcrop for the manufacture of stone tools – this site is avoided by the current development footprint;
- Historic period disused feeding / watering trough made of modern materials (IW4) – not conservation worthy and no mitigation is required;
- Stone Age quarrying / flaking of outcropping quartzite (IW5) – not impacted by the current design layout, and no mitigation is required;
- Late Stone Age and Middle Stone Age stone artefacts in sand quarry (IW6) - no mitigation is required, but it is recommended that archaeological monitoring of the area to the south of the dashed white line shown in Figure 6.28 be undertaken during construction.
- *In situ* Middle Stone Age and Early Stone Age stone artefacts in the exposed geological profiles of a quarry (IW7) – avoided by current design layout, but it is recommended that archaeological monitoring of the surrounds within the dashed white ellipse shown in Figure 6.28 be undertaken during construction.

Figure 6.28: Archaeological resources on the Impofu West site

6.10.3 Impact assessment with mitigation

Clearing of vegetation and construction activities may impact archaeological resources and ultimately the cultural landscape, therefore the construction phase is considered a potential risk to these resources. It is very likely that implementation of the proposed mitigation measures provided by Nilssen (2019) can greatly reduce the direct impact of the Impofu West Wind Farm. Commissioning of the AIA as part of the environmental process will also likely result in a positive impact in that the study has greatly improved the record and understanding of archaeological material in the area and provided an opportunity to conserve them.

The only potential impacts detailed in the following tables are summarised below – all other potentially sensitive heritage artefacts (listed in Section 6.10.1.2) have been avoided by the current layout design:

- Potential impact on the pre-colonial cultural landscape along the 5 km coastal strip; and
- Potential impact on the *in situ* Middle Stone Age and Early Stone Age stone artefacts at quarry IW7.

Table 6.55: Pre-colonial landscape along 5 km wide coastal strip

Phase		**Construction**		
Impact description	The 5 km wide coastal strip has been identified as a sensitive area in terms of archaeological resources and the greater pre-colonial cultural landscape. The undisturbed coastal dune portions of this area has been marked as a No-Go zone for the proposed wind farm development and will likely reduce the visual and physical impact of the wind farm on this area. LSA & MSA stone artefacts at the sand quarry (IW6) as well as the isolated combination hammer stone / grind stone / anvil found at a geotechnical test pit within the site are considered to fall within the pre-colonial cultural landscape along the 5 km wide coastal strip.			
	Without mitigation		**With mitigation**	
Nature	Negative		Neutral to negligible	
Duration	Permanent		Permanent	
Extent	Local		Very limited	
Intensity	Low		Negligible	
Significance	**MODERATE (-)**		**NEGLIGIBLE (-)**	
Probability	Certain / definite		Probable	
Confidence	High		High	
Reversibility	Low		Low	
Resource irreplaceability	Medium		Medium	
Mitigation measures				
• It is recommended that archaeological monitoring be undertaken in the area south of the white dashed line as indicated Figure 6.28. • Archaeological monitoring should be supervised by a suitably qualified and accredited professional archaeologist during the construction phase of the development.				

Table 6.56: Impact on surrounds of quarry with *in situ* ESA and MSA stone artefacts

Phase		Construction		
Impact description	The stone age quarrying site at IW7 comprises of a fairly small quartzite outcrop where numerous flake scars resulting from Stone Age quarrying of raw material for the manufacture of stone tools occur. The quarry is in close proximity to proposed construction works.			
	Without mitigation		**With mitigation**	
Nature	Negative		Neutral to negligible	
Duration	Permanent		Permanent	
Extent	Regional		Very limited	
Intensity	Moderate		Negligible	
Significance	**MAJOR (-)**		**NEGLIGIBLE (-)**	
Probability	Certain / definite		Probable	
Confidence	High		High	
Reversibility	Low		Low	
Resource irreplaceability	Medium		Medium	
Mitigation measures				
• It is recommended that the surrounding area of the Impofu West Wind Farm site within the dashed white ellipse shown in Figure 6.28 be monitored during construction. • Archaeological monitoring should be supervised by a suitably qualified and accredited professional archaeologist during the construction phase of the development.				

Other applicable general mitigation that applies to the construction phase includes the following:

- Before the potential three sections of 33kV overhead line are constructed, a final micrositing walkthrough must be undertaken to ensure that any unforeseen impacts due to this line are mitigated.
- The contractor must supply the suitably accredited professional archaeologist that will oversee the monitoring with a construction programme at least 4 weeks before construction starts to ensure the monitoring can be properly planned.
- Archaeological induction should be performed, in tandem with environmental induction, by a professional and suitably experienced archaeologist prior to the construction phase of development to ensure that all persons working on the wind farm site are familiar with the types of heritage resources that may be exposed during construction and the necessary steps to follow in the event that archaeological resources are unearthed.
- In the event that vegetation clearing and earthmoving activities expose archaeological or palaeontological resources, then such activities must stop immediately and the South African Heritage Resources Agency (SAHRA) and/or the Eastern Cape Provincial Heritage Resources Authority (ECPHRA) must be notified immediately. These heritage resources are protected by Section 35(4) of the NHRA (Act 25 of 1999) and may not be damaged or disturbed in any way without a permit from the relevant heritage authorities. Any work in mitigation, if deemed appropriate, should be commissioned and completed before construction continues in the affected area and will be at the expense of the developer.
- In the event of exposing human remains during construction, then the find should be protected from further disturbance and work in the immediate area should be halted. The find will fall into the domain of SAHRA and would need to be reported to them, and will require inspection by a professional

archaeologist to undertake mitigation, if needed. Any disturbance to a human burial older than 60 years will require a permit in terms of Section 36 (3)(a). Graves and burial grounds are the property of the state and may require excavation and curation in an approved institution. Any work associated with the find will also be at the cost of the developer.

6.10.4 No-Go alternative

The No-Go alternative means that the proposed project will not be developed and the *status quo* will remain at the site. This will likely involve continued negative impacts of low or unknown significance on archaeological resources due to natural processes and agricultural activities. The overall impact of the proposed development is likely to be low, therefore if the existing impacts can be controlled as well as monitored, then there is no preference between developing and not developing the proposed Impofu West Wind Farm.

6.10.5 Conclusions and recommendations

The AIA for the proposed Impofu West Wind Farm was informed through a detailed desktop literature review and various site surveys by the archaeologist, as well as an iterative screening process to identify No-Go areas. As a result most of the sensitive archaeological resources have been avoided. The main conservation worthy archaeological sites that will be conserved at Impofu West Wind Farm site are: the exclusion of the archaeological sensitive area in the undisturbed dunes in the south shown as a No-Go zone; the avoidance of stone age quarry sites and associated low density artefact scatter; and the avoidance of *in situ* early stone age and middle stone age materials in the quarry (positive impact of preserving the resources at the quarry). The development proposal therefore has no fatal flaws from an archaeological perspective.

6.11 Noise and shadow flicker

The information included in this section is drawn from the Noise and Shadow Flicker Specialist Report attached as Appendix E9, undertaken by Ms. Lien van Breusegem of 3E Renewable Energy Services (3E, 2019).

6.11.1 Baseline description

Wind turbines are responsible for both aerodynamic and mechanical noise which can be emitted as self-noise (interaction of the turbulent boundary layer with the blade trailing edge), inflow turbulence (turbulence from the wind interacting with the blades), frequency noise (due to tailing edge thickness or unstable flow close to the surface of the blade) and noise from the rotor tips.

Shadow-flicker occurs when the rotation of wind turbine blades results in alternating periods of shadow and light to a receptor. Shadow-flickering will only occur when the position of the turbine is between the sun and the receptor, and only when the turbine is operating and the sun is shining.

Noise levels are affected by various factors such as topography, land use, vegetation cover, roads, etc. According to the noise and shadow flicker specialist, the following landscape features are expected to have an impact on existing ambient noise levels, as well as the occurrence of shadow flicker:

- **Topography** – The site is located in an undulating, rural landscape and, as a result, has the potential to absorb noise and limit shadow-flicker.
- **Roads** – Mainly farm roads (i.e. dirt roads) occur within the area.
- **Land use** – The main land use within the area is agriculture which contributes to the background ambient noise levels. The three operating wind farms are also contributing to the background ambient noise levels.
- **Residential areas** – The following four residential areas occurs within the landscape, namely: Oyster Bay (10 km to the south-east), Humansdorp (18 km to the north-east) St Francis Bay (24.5 km to the east) and Cape St Francis (26 km to the east).

- **Ground conditions and vegetation** – Untransformed areas are well vegetated and provides relatively soft ground conditions in terms of noise propagation. Forested areas also occur within the landscape.

Based on the above considerations, a rural ambient noise level of 45 dB(A) has been accepted as the baseline for the local area. However, 13 receptors are located within the Tsitsikamma Community Wind Farm and would be experiencing noise levels exceeding 45 dB(A) due to the operational turbines. Therefore, the noise level nature of this area cannot be considered rural.

No national or local maximum shadow flicker thresholds exist for South Africa. For this reason, a limit of 30 hours per year was assumed to be the acceptable limit based on international shadow flicker thresholds[12]. Based on the modelling, it was determined that 18 sensitive receptors are currently already experiencing an exceedance in shadow flicker of the 30 h/yr threshold at the Tsitsikamma Community Wind Farm.

6.11.2 Site sensitivity

Since South Africa does not have legislation or guidelines enforcing minimum distances between turbines and dwellings, a minimum buffer distance[13] of 500 m was applied to all houses and places of work within a radius of 3 km of the proposed turbine locations as shown in Figure 6.29 below. The 13 receptors within the Tsitsikamma Community Wind Farm were however assessed as sensitive receptors (see Figure 6.30).

Figure 6.29: Location of sensitive receptors on the Impofu West site with a 500 m No-Go buffer applied (3E, 2019)

[12] This limit is also used in the World Banks Environmental, Health and Safety Guidelines for Wind Energy.
[13] Internationally, 500 m is considered an acceptable setback distance between turbines and dwellings and have also been specified in South African environmental authorisations for wind farms.

6.11.3 Impact assessment with mitigation

Both construction and operational noise are likely to be generated by the project, as well as shadow flicker from the operation of the turbines. The predicted impacts listed below are detailed in the following tables and depicted graphically thereafter in Figure 6.30 and Figure 6.31

- Construction noise;
- Operational noise; and
- Operational shadow flicker.

Table 6.57: Construction and decommissioning impact: noise

Phase		Construction		Decommissioning
Impact description	Construction related noise would result from the equipment being used (e.g. excavators, graders, bulldozers, etc.) and the activities undertaken (e.g. excavations, batching plants, etc.), as well as traffic on site, and to and from the site. It is expected that the volume and type of traffic generated, would vary during the construction period, depending on the activities undertaken at a specific point in time. The impact of the construction noise can be estimated by combining the different sources by adding them logarithmically. As it is unknown where the different activities may take place and how they will be combined, a scenario with noise levels of 115 dB(A) at the wind turbines locations was modelled. It was found that that the construction noise will have little impact on the surrounding community as it will mostly occur during the day when the ambient noise is louder and there are unstable atmospheric conditions. The construction noise will be transient in nature and in all likelihood not constant for extended periods as the construction team will move from site to site.			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	Brief		Brief	
Extent	Limited		Very limited	
Intensity	Very low		Very low	
Significance	**MINOR (-)**		**MINOR (-)**	
Probability	Certain / definite		Almost certain / Highly probable	
Confidence	Medium		Medium	
Reversibility	High		High	
Resource irreplaceability	Low		Low	
Mitigation measures				
• Mechanical equipment with lower sound power levels shall be selected to minimise impact. • Construction workers and personnel shall wear hearing protection when required. • Vehicles and machines shall be properly serviced and well maintained. • Vehicles must adhere to speed limits. • A proactive warning system shall be established to inform affected community members of the planned construction activities with an estimation of the commencement date and duration of each activity. • A grievance procedure shall be established whereby noise complaints by affected community members are recorded and responded to.				

Table 6.58: Operational impact: noise

Phase			Operational	
Impact description	Operational noise could originate from mechanical noise or aerodynamic noise and varies by wind speed. The study found that no sensitive receptors were identified within the 45dB(A) contour of the Impofu West Wind Farm (Figure 6.30). It was found that all of the receptors with an exceedance of the 45 dB(A) limit are located within the TCWF. All 13 of these would now experience exceedances of between 45.1 dB(A) and 50.7 dB(A). The additional noise level on these receptors caused by the project is limited to a maximum of 0.5 dB(A) which is an inaudible difference. For all receptors (including those not already affected by TCWF), the noise levels are never calculated to be higher that an increase of 3 dB(A). Through application of the guidelines (SANS 10103) the turbines will not cause any response from the surrounding community.			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	On-going		On-going	
Extent	Limited		Limited	
Intensity	Negligible		Negligible	
Significance	**NEGLIGIBLE (-)**		**NEGLIGIBLE (-)**	
Probability	Highly unlikely / none		Highly unlikely / none	
Confidence	High		High	
Reversibility	High		High	
Resource irreplaceability	Low		Low	
Mitigation measures				
• No mitigation required.				

Table 6.59: Operational impact: shadow flicker

Phase			Operational	
Impact description	In terms of shadow flicker, a further 6 receptors (mainly dwellings), in addition to the 18 currently being impacted, would experience an exceedance of the 30 h/yr threshold from the proposed project should it be constructed (seen in Figure 6.28). It must be noted that the 6 receptors that would potentially be impacted are all within the Impofu West Wind Farm site.			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	On-going		On-going	
Extent	Limited		Very limited	
Intensity	Negligible		Negligible	
Significance	**MINOR (-)**		**NEGLIGIBLE (-)**	
Probability	Certain / definite		Probable	
Confidence	Medium		Medium	
Reversibility	High		High	

Resource irreplaceability	Low	Low
Mitigation measures		
• Measurements shall be taken of the actual shadow-flicker impact at the identified sensitive receptors given the assessment used conservative assumptions and it is likely the actual impacts will be less than modelled. • If exceedances have been determined, blinds shall be installed in the affected windows and/or trees and evergreen vegetation (indigenous) shall be planted between the turbines and the affected windows.		

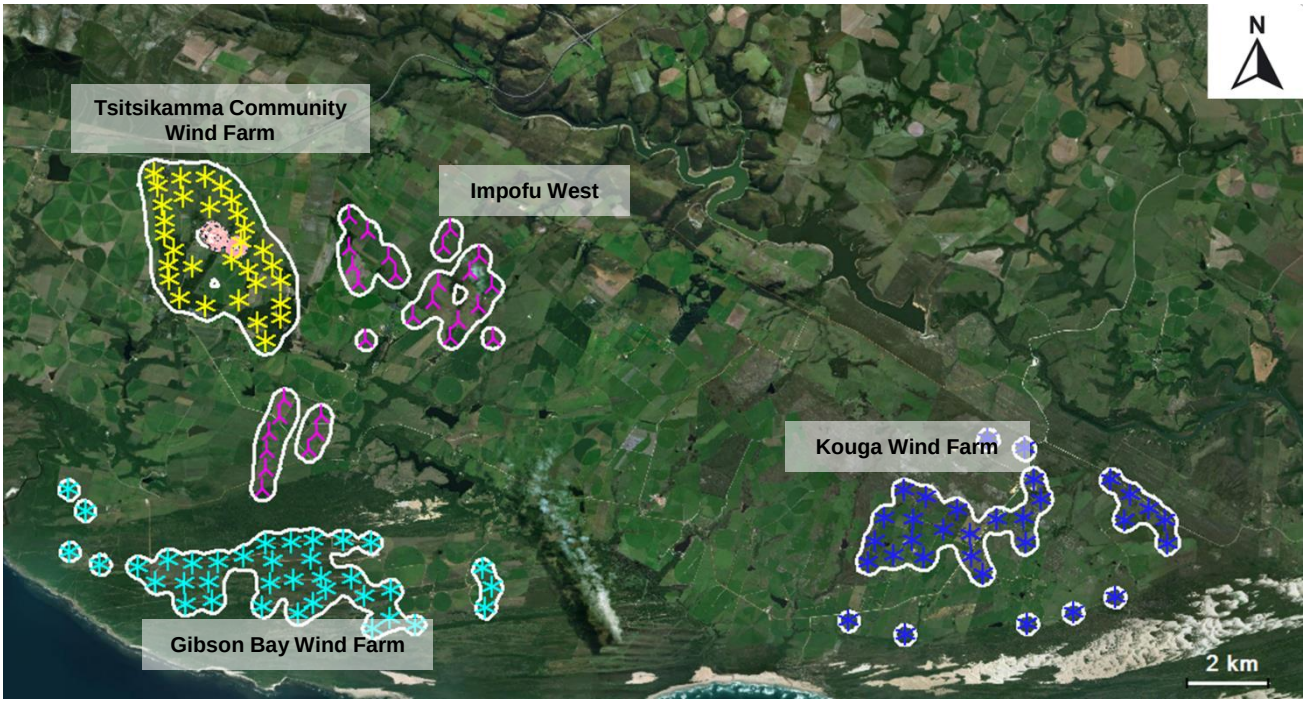


Figure 6.30: Noise contour map showing receptors that exceed the limit (white line: 45dB(A) contour lines; pink circles: receptor with exceedance of 45dB(A)) (3E, 2019)

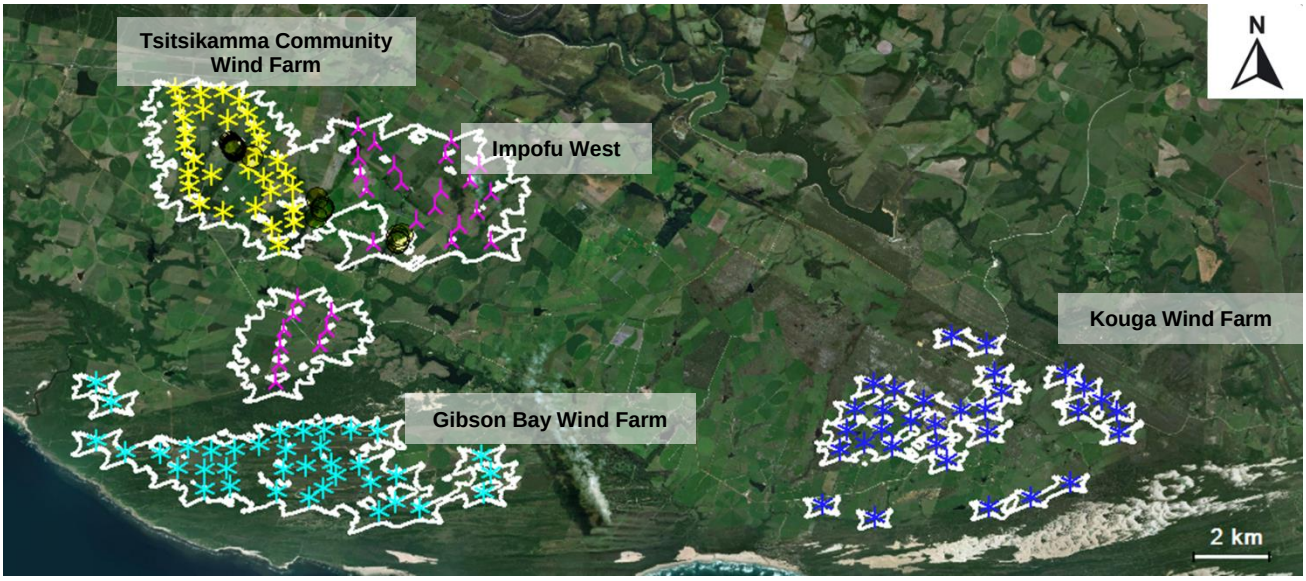


Figure 6.31: Shadow contour map showing receptors that would experience an exceedance of the shadow flicker limit (white line: 30 h/yr contour line; black circles: sensitive receptors) (3E, 2019)

6.11.4 No-Go alternative

Should the Impofu West Wind Farm not be developed, the noise levels and shadow-flicker impacts would remain similar to the baseline scenario as described in Section 6.11.1. This impact is considered to be of neutral significance.

6.11.5 Conclusion and recommendations

The project site is in a rural landscape with three operating wind farms in the local area, namely: Kouga Wind Farm, Gibson Bay Wind Farm and Tsitsikamma Community Wind Farm. These operational wind farms are considered to contribute to the baseline noise and shadow flicker environment, especially on the Tsitsikamma Community Wind Farm where exceedances are already being experienced.

During the construction phase noise related impacts are expected to occur with a significance rating of minor negative with and without mitigation. This impact will however be negligible negative during the operational phase and no mitigation is available. Shadow-flicker impacts are considered relatively easy to mitigate and anticipated to be minor negative without mitigation. This impact should however be reduced to negligible negative by taking measurements after the turbines have been constructed, to confirm if sensitive receptors are experiencing exceedances of 30 hours per year limit and as a result in need of the mitigation measures.

6.12 Visual

The information included in this section is drawn from the Visual Specialist Report attached as Appendix E10, undertaken by Mr. Bernard Oberholzer and Mr. Quinton Lawson (Oberholzer and Lawson, 2019).

6.12.1 Baseline information

Table 6.60 provides a description of the landscape and scenic features identified for the Impofu West Wind Farm site, as well as potential receptors identified by the specialist.

Table 6.60 Landscape and scenic characteristics of the Impofu West Wind Farm site

Characteristic	Description
Landscape setting	The site is located in the Eastern Cape, approximately 18 km west of Humansdorp, on a broad flat coastal plain. The site lies south of the N2 National Road, and R102 Main Road. The area, known for its dairy farming, is flanked on the north-western boundary by the Tsitsikamma Community Wind Farm and Gibson Bay Wind Farm in the south-east and south-west.
Geology and landforms	The study area is a flat to gently undulating peneplain, underlain by quartzitic sandstones of the Cedarberg and Peninsula Formations of the Table Mountain Group (Geological Survey, 2011). The southern section of the site has aeolian sand that has formed hardened aeolianite in places (mainly the parallel dune ridges). The approximate elevation ranges from sea level in the south to 200 m in the north. The peneplain has been dissected by a number of rivers, including the Krom River to the north-east of the site, forming a deep ravine. The Klipdrift River runs through the middle of the site. A number of dams have been constructed on these rivers and their tributaries, of which the Impofu Dam (on the Krom River) is the largest.
Vegetation cover and land use	Most of the indigenous vegetation has been replaced by pasture and fodder for the dairy farming in the area. Copses and avenues of exotic trees such as gums, pines and beefwoods, have historically been planted around the farmsteads. Infestations of black wattle have invaded large areas, mainly along the river courses. A dense indigenous dune forest does however occur along the coastline and in the dune slacks.

Characteristic	Description
	There are existing wind farms adjacent to the Impofu West Wind Farm along with a number of other wind farms in the wider surroundings (i.e. Kouga Wind Farm and Jeffreys Bay Wind Farm).
Scenic features and receptors	The study area has a pleasing rural character with green pastures grazed by cattle and sheep, interspersed by crops and wooded ravines along the stream courses. There are numerous farmsteads, both on the site and in the immediate surroundings. The nearest settlements are Oyster Bay (10 km to the south), Humansdorp (18 km to the east) and Clarkson (20 km to the west). There are several nature reserves and game farms in the general area, specifically, the Jumanji Game Farm (10 km to the north) and Thaba Manzi Game Farm (10-15 km). Other receptors would be the users of the N2 National Road and the R102 Main Road approximately 5 km away.

6.12.2 Site sensitivity

Site sensitivity with regards to potential visual impacts, are determined based on the following considerations:

- **Visibility** – the degree to which the turbines are visible is subject to foreground topography.
- **Visual exposure** – the geographic area within which the project would be visible (i.e. the wind farm would be located on a visually exposed plain while the Kareedouwberg ridge provides a view shadow to some areas to the north-west).
- **Landscape integrity -** visual quality tends to be enhanced by scenic or rural quality and intactness of the landscape (including the absence of other visual intrusions).
- **Visual sensitivity –** mainly determined by topographic features such as ridgelines (e.g. the Krom River ravine is a notable scenic feature), but also cultural landscapes (e.g. scenic value of a traditional farmed landscape).
- **Visual absorption capacity (VAC)** – the potential of the landscape to screen (i.e. absorb) views of the wind farm project.

Table 6.61 below provides a summary of the sensitive features that were identified for each of the visual criteria explained above, which is also visually shown in Figure 6.32 and Figure 6.33.

Table 6.61 Site sensitivity with regards to various visual criteria (Oberholzer and Lawson, 2019)

Visual criteria	Description	Wind turbines	Related infrastructure
Visibility of facilities	The wind farm would be visible from a number of farmsteads, the N2 and R102 routes, and part of the Huisklip Nature Reserve.	High	Low
Visibility of lights at night	Navigation lights on turbines, security lighting at substation and operational and maintenance buildings.	Medium	Medium
Visual exposure	The wind farm would be located on a visually exposed plain, but will also be partly screened by landforms to the north-west.	High	Low
Landscape integrity	The site has already been altered by the existing wind farms in the area, while still maintaining a rural farming character.	Medium	Medium
Landscape/ visual sensitivity	The Kareedouwberg ridgeline, Krom River ravine, nature reserves, farmsteads, N2 and the R102 route have heritage and scenic significance.	High	Low

Visual criteria	Description	Wind turbines	Related infrastructure
Visual absorption capacity	The site has a low visual absorption capacity due to its location on a plain. The coastline is however partly screened by the dune topography.	High	Medium

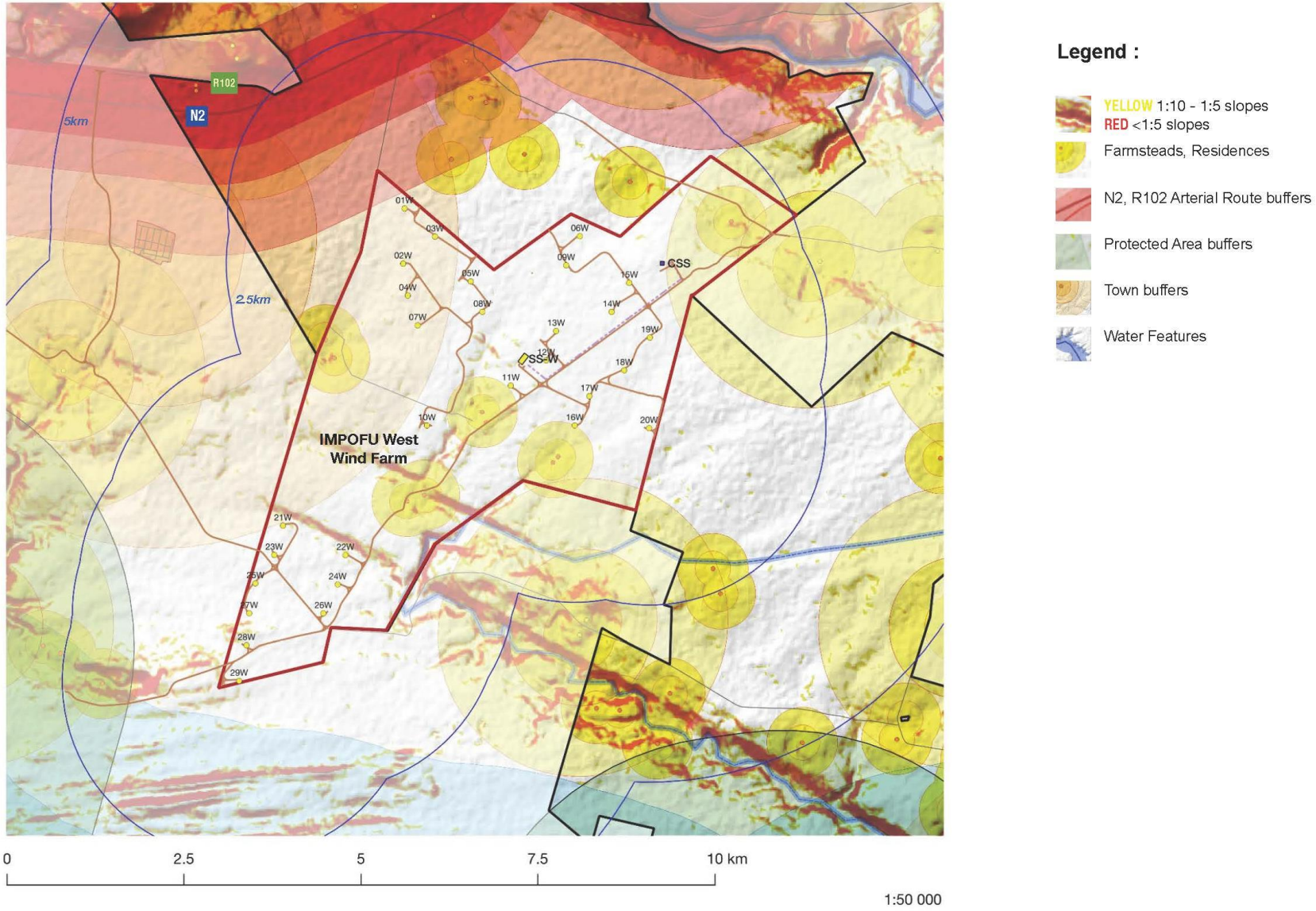
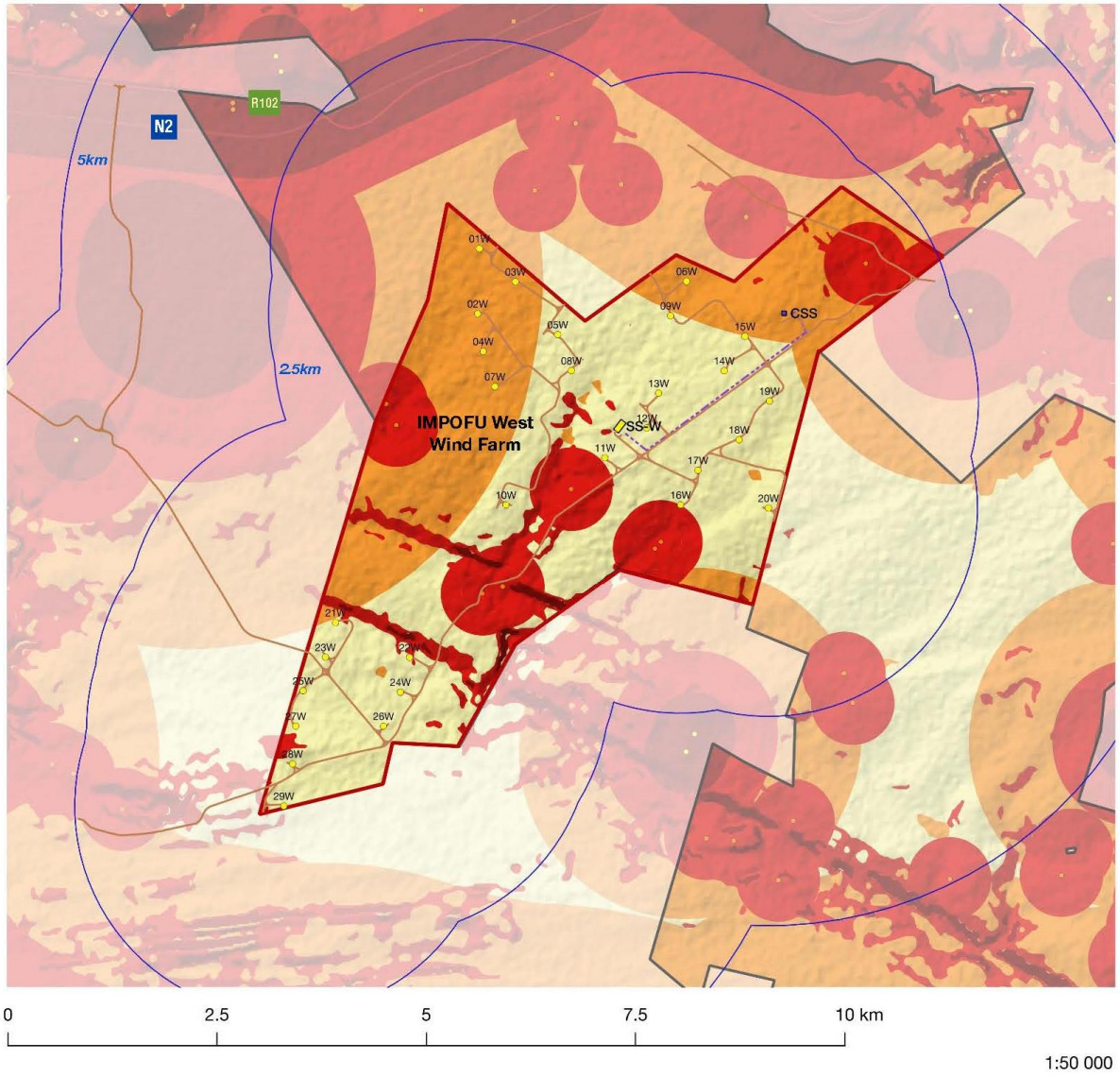


Figure 6.32: Visual constraints and buffers (Oberholzer and Lawson, 2019)



Visual Sensitivity Legend :

- Very High
- High
- Moderate
- Low

Figure 6.33 : Visual sensitivity map

6.12.3 Impact assessment with mitigation

The visual assessment of the proposed wind farm is based on a number of quantitative and qualitative criteria to determine potential visual impacts, as well as their relative significance, including visibility, visual exposure, landscape integrity, visual sensitivity and visual absorption capacity, with an overall visual impact intensity. This was informed by the quantification and assessment the existing scenic resources/visual characteristics on and around the study area, and the determination of the viewsheds, view corridors and important viewpoints in order to assess the visual influence of the proposed project. The predicted impacts listed below are detailed in the tables below:

- Visual intrusion of construction activities on the rural landscape and scenic resources as a result of construction activities;
- Visual effect of operational wind turbines on the rural/cultural landscape and on surrounding farmsteads/settlements;
- Shadow flicker caused by wind turbines to nearby receptors in the early morning and late afternoon (assessed in Section 6.11);
- Visual clutter of on-site substation, operations and maintenance structures and connecting powerlines;
- Visual intrusion caused by navigation lighting from turbines and security lighting at substations and operational and maintenance structures; and
- Visual intrusion of remaining structures and access roads on the rural landscape following decommissioning.

Table 6.62: Construction phase: visual intrusion on the rural landscape and scenic resources

Phase		**Construction**		
Impact description	Potential visual intrusion, construction traffic, cranes, dust and noise, from the construction of both wind turbines and related infrastructure, affecting the rural sense of place and scenic resources. This includes visual scarring of the landscape by earthworks for access roads.			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term		Short term	
Extent	Local		Local	
Intensity	High		Moderate	
Significance	**MODERATE (-)**		**MINOR (-)**	
Probability	Certain / definite		Almost certain / Highly probable	
Confidence	High		Medium	
Reversibility	High		High	
Resource irreplaceability	Low		Low	
Mitigation measures				
• <u>Pre-construction phase:</u> • Internal powerlines to be located underground where possible. • Existing roads / tracks to be used as far as possible and new access / maintenance roads kept as narrow as possible. • Substations to be located in unobtrusive positions, avoiding ridgelines or hillcrests, or alternatively screened by earth berms and tree planting, as largely implemented in the current layout.				

- Construction phase:
- Construction camps and storage/stockpile areas to be located in unobtrusive positions in the landscape, away from main roads, farmsteads and scenic areas, or alternatively screening measures utilised, as implemented in the current layout.
- Construction camps to be clearly delineated and limited in size to only that which is essential.
- Implementation of dust suppression and litter control measures.
- Construction activities to be restricted to normal working hours where possible, or alternatively conform with mitigations in the Noise Impact Assessment.
- Adherence to an Environmental Management Programme (EMPr), monitored by an Environmental Control Officer (ECO).

Table 6.63: Operational impact: visual intrusion of the wind turbines on the rural landscape, settlements, scenic resources and overall sense of place

Phase			**Operational**	
Impact description	Potential visual intrusion of the wind turbines with associated assembly pads and roads, on the rural landscape, settlements, scenic resources and overall sense of place. Affected Areas are indicated on Figure 6.33 above, also refer to Figure 6.34 for a photomontage. The visual impact is partially offset by existing wind farms in the landscape particularly where viewsheds overlap.			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	On-going		On-going	
Extent	Municipal area		Municipal area	
Intensity	Very high		Very high	
Significance	***MAJOR – MODERATE (-)**		***MAJOR – MODERATE (-)**	
Probability	Certain / definite		Certain / definite	
Confidence	High		High	
Reversibility	High		High	
Resource irreplaceability	Low		Low	
Mitigation measures				
• Little potential for visual screening of wind turbines.				

Table 6.64: Operational impact: visual intrusion of related infrastructure on the rural farming landscape

Phase			**Operational**	
Impact description	Visual clutter of substation, O&M buildings, roads and power lines on the rural farming landscape.			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	On-going		On-going	
Extent	Local		Local	
Intensity	Moderate		Low	

Significance	MODERATE (-)	MINOR (-)
Probability	Certain / definite	Almost certain / Highly probable
Confidence	High	Medium
Reversibility	Medium	Medium
Resource irreplaceability	Low	Low
Mitigation measures		
• Substation and O&M buildings to be screened with earth berms and tree or hedge planting, if close to main roads or district roads and highly visible from these roads. • External signage kept to a minimum and billboard type signs avoided.		

Table 6.65: Operational impact: visual intrusion of lights at night on dark skies

Phase			Operational	
Impact description	Introduction of navigation lights on turbines, security and area lighting will create visual intrusion at night on dark skies.			
	Without mitigation		With mitigation	
Nature	Negative		Negative	
Duration	On-going		On-going	
Extent	Municipal area		Municipal area	
Intensity	Low		Low	
Significance	MODERATE (-)		*MODERATE – MINOR (-)	
Probability	Certain / definite		Almost certain / Highly probable	
Confidence	High		Medium	
Reversibility	High		High	
Resource irreplaceability	Low		Low	
Mitigation measures				
• Navigation lights to be kept to the minimum allowed by the Civil Aviation Authority (CAA). • Security and area lighting at substations and O&M buildings to be fitted with reflectors to minimise light spillage. • Low-level lights used in preference to lamp standards.				

Table 6.66: Decommissioning phase: visual intrusion of remaining infrastructure on the rural landscape

Phase				Decommissioning
Impact description	There will be lasting visual intrusion from the remaining platforms, structures, concrete slabs and access roads, on the rural landscape.			
	Without mitigation		With mitigation	
Nature	Negative		Negative	
Duration	Long term		Short term	
Extent	Local		Limited	
Intensity	High		Moderate	

Significance	MODERATE (-)	MINOR (-)
Probability	Certain / definite	Almost certain / Highly probable
Confidence	High	Medium
Reversibility	High	High
Resource irreplaceability	Low	Low
Mitigation measures		
• Wind turbines removed and building structures demolished or recycled for new uses. • Hardened platform areas and access roads no longer required to be ripped and regraded. • Exposed or disturbed areas revegetated or returned to grazing pasture or natural vegetation to blend with the natural surroundings.		

Figure 6.34: Highly visible from Villa Fonte Farm Gate (Viewpoint 6, in Quinton and Lawson, 2019)

6.12.4 No-Go alternative

The No-Go alternative implies that the landforms and skyline would remain visually intact. For this reason, the anticipated impact is rated as neutral.

6.12.5 Conclusion and recommendations

The proposed wind farm would have a relatively minor visual influence on the coastline and protected areas, such as nature reserves, in the general area, due to distance and their location within a view shadow. The layout of the proposed wind turbines largely succeeds in avoiding most constraints for this area due to the removal and micro-siting of the most problematic turbines where possible during the iterative site layout design process. As a result, no further mitigation of the wind farm is possible without removal of some turbines from the overall complement. This impact is therefor considered to be of major to moderate (negative) significance with and without mitigation but the visual impact is partially offset by existing wind farms in the landscape particularly where viewsheds overlap.

The potential visual impact significance of related infrastructure, such as the substation and operational and maintenance buildings, would be moderate negative before mitigation and minor negative with mitigation. The impact of lighting would also result in a moderate negative impact which can be reduced to moderate-minor with mitigation.

It is important to note that the project would be located in an area already characterised by wind farms and that has been taken into account in the baseline. The cumulative impact of this project along with other future proposed wind farm is discussed in more detail in Section 7.

The height of the wind turbines could possibly be taller in some cases than the existing wind turbines of adjacent wind farms. This generally tends to have only a marginal effect on the viewshed and overall change in character to the area. Furthermore, the fact that the proposed Impofu West Wind Farm could potentially be dismantled during the decommissioning phase in the long term, and the site restored to more or less its original state, is a positive consideration.

It is the opinion of the specialists that the preferred Impofu West Wind Farm layout does not present a potential fatal flaw in visual terms, given the changes undertaken to date during the iterative process resulting in the current preferred layout.

6.13 Traffic

6.13.1 Baseline information

6.13.1.1 Road Network

Roads within the affected network are under the jurisdiction of the Provincial Roads Department and the South African National Road Agency (SANRAL). The national and main provincial roads are paved, while the district roads which service the agricultural community, are unpaved. Table 6.67 below lists the roads that will be potentially affected by the project; the key roads traversing the study area are indicated by an Asterix (*).

According to the Traffic Impact Study Manual, the acceptable level of service (LOS) for rural roads (Classes 3 to 5) is Level of Service (LOS) C, with an acceptable distance between vehicles of 250 and 400 metres.

Access off the N2 is primarily via Exit 632 (Palmietvlei off ramp onto DR01776) and Exit 647 (Kareedouw off ramp onto TR04403).

Table 6.67: The road network to the project development

Jurisdiction	Road Classification	Road Number	Class
SANRAL	National Roads	NR00210 (N2)	1
	Trunk Roads	TR04403 (R62)	2
Provincial Roads Department	Main Roads	MR00381 (R330)	3
		MR00392	4
	District Roads	DR01778 (R102)	4
		DR01779 (R102)	4
		DR01761	4
		DR01762	4
		*DR01763	4
		*DR01764	5
		*DR01765	4
		*DR01774	4
		DR01776	4
	Minor Roads	*MN50032	5
		MN50076	5
		MN50092	5

6.13.1.2 Road network affected during construction

As described in the project description (Section 5), the following activities will generate additional vehicle movements on the local road network during the construction phase:

- Construction equipment, such as tools, machinery, scaffolding, formwork, etc. will be delivered to site at the commencement of the construction.
- Gravel for the roads, sub-station platforms, roads and hardstand platforms adjacent to each turbine, worst-case scenario assumes that all material required (80,000 m^3) is sourced from commercial quarries, outside the study area (although it is anticipated that any suitable material excavated from the turbine foundations shall, where possible, be used for the construction of roads and hardstand platforms).
- Raw material for the concrete, assumed to be delivered to site from commercial sources: approximately 5,200 tons of cement, 9,000 m^3 of sand, and 10,500 m^3 of stone.
- Turbine components, each turbine consists of approximately thirteen components, i.e. tower sections, blades, gearbox, nacelle, generator, nose cone, hub, etc., each of which are to be individually transported to site, most of which are abnormal loads. Most of the components are imported in to South Africa and will be delivered from the Ngqura Container Terminal near Port Elizabeth. Except for the tower sections which are fabricated locally and could be transported to site from Cape Town.
- Construction staff will not reside on the site and therefore they will be required to travel from their respective locations, namely Humansdorp, Jeffreys Bay, St Francis, Oyster Bay and Clarkson/Kareedouw.

Although there will be one central site camp, the distribution of the 29 wind turbines allows the site to be divided into five district zones in terms of access (Figure 6.35). Each zone has multiple potential access points indicated in Table 6.68.

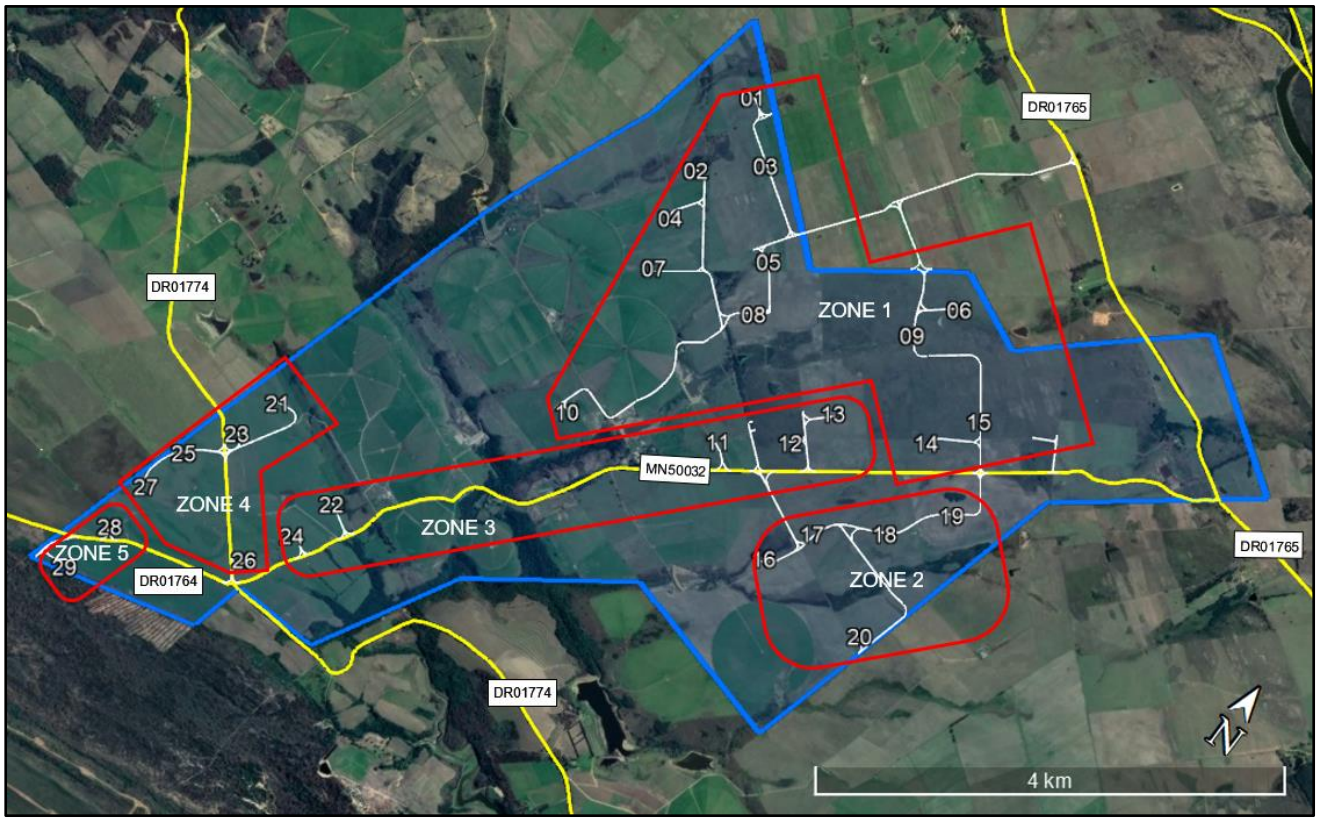
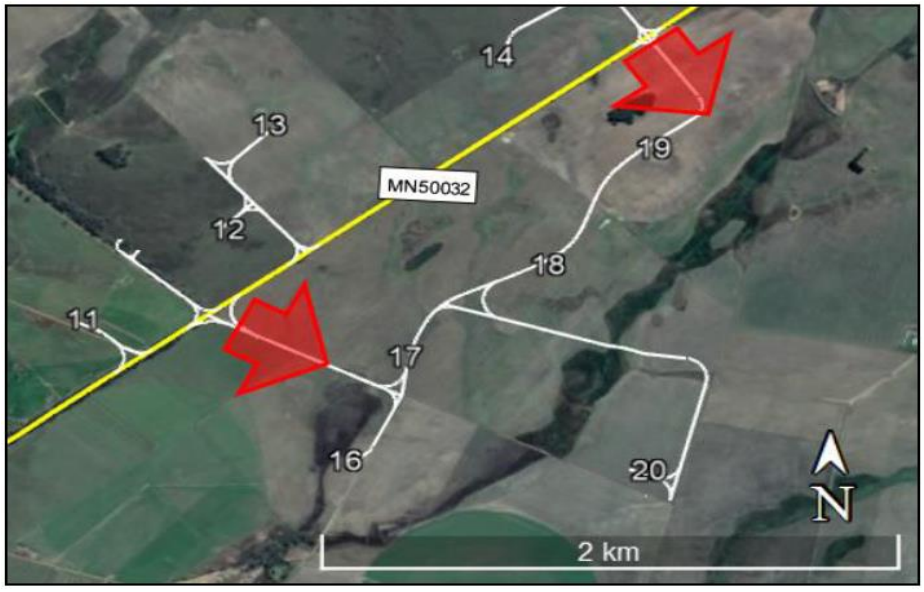


Figure 6.35: Road network showing turbine zones for construction

Table 6.68: Access routes to each zone of the site

Description	Figure
Zone 1 (12 turbines)	
Northern entrance is from the DR01765-1, this is an existing informal farm entrance that will have to be upgraded to accommodate the delivery of the relevant abnormal loads, the details of which will be finalised during the design stage of the internal road network; Southern entrance is from the MN50032, this is a new intersection, the details of which will be finalised during the design stage of the internal road network.	
Zone 2 (5 turbines)	
Northern entrance, this is a new intersection, the details of which will be finalised during the design stage of the internal road network; Southern entrance, this is an existing informal farm entrance that will have to be upgraded to accommodate the delivery of the relevant abnormal loads, the details of which will be finalised during the design stage of the internal road network.	
Zone 3 (5 turbines)	
This zone is accessed via four entrances, from the MN50032. These are all new intersections, the details of which will be finalised during the design stage of the internal road network	

Description	Figure
Zone 4 (5 turbines)	
This zone is accessed via three entrances, from the DR01774. These are all new intersections, the details of which will be finalised during the design stage of the internal road network.	
Zone 5 (2 turbines)	
This zone is accessed via two entrances, from the DR01764. These are all new intersections, the details of which will be finalised during the design stage of the internal road network.	

Abnormal loads (including turbines components and transformers) shall be delivered to pre-defined areas in each zone. Site deliveries (excluding abnormal loads) will also arrive via the N2 via two possible routes to each zone depending on which interchange they use. Transportation routes of the aggregate for the batching of concrete is based on the assumption that the batching plant will be erected in the zone which contains the most turbines for the project. Thus, the transportation route of all aggregate for the batching of concrete will be to Zone 1. The preferred route from the N2 will be via exit 647 (Kareedouw off ramp onto TR04403), south along TR04403, right onto DR01779-3, left onto DR01765-1 then right onto site, through a section of the Impofu North site. The dispatching of concrete from the batching plant to each turbine locations will be required, generating a high number of trips over a short time frame. The internal road network shall be designed to minimise the use of public roads. However, due to the nature of the road network, intersections on the DR01774 to access zone 4), DR01764 (to access zone 5) and MN50032 (to access Zone 1 and 3) will be inevitable.

Personnel access routes, emanating from the local community will use either the DR01779 (for personnel originating from Humansdorp, Jeffreys Bay and Paradise Beach) and DR01765 (for personnel origination from Cape St Francis, St Francis Bay and Oyster Bay). The movement of material on site includes batching and dispatching of concrete.

Upgrades to the vertical or horizontal alignment of the local access roads and intersections may be required depending on the length and width of abnormal vehicles. These alignments and grades cannot be determined at this stage, as the abnormal vehicle dimensions can only be determined once the wind turbine technology has been selected.

A construction period of twenty-four months is anticipated. The two most significant activities that have the largest impact on traffic volumes during the construction phase are the movement of personnel to and from site and the delivery of equipment. The simultaneous occurrence of these two activities are highly unlikely.

The movement of personnel will contribute to peak traffic (6:30-7:30 am and 16:30-17:30). It has been estimated that approximately 200 site personnel will be required, 10% senior staff and 90% workforce. The transportation of the personnel to and from site are expected to be from various communities within a 35 km radius. Peak traffic (single direction) is generated by only twenty-two vehicles (including light vehicles, Mini-busses and busses). These vehicles are distributed over the various roads with varying concentrations. The maximum number of additional vehicles on any one road within in a given hour, will never exceed nineteen.

The delivery of equipment and materials to site is envisaged to occur during normal working hours, throughout the day. No night deliveries are anticipated and is strongly discouraged. Given the distance from origin of the material and components of the development, it is assumed that most deliveries will only start arriving at site an hour or two after work on site commences and will stop an hour or two before work on site concludes for the day. These activities contribute to Diurnal Traffic (7:30-16:30) and include movements for site establishment, delivery of construction equipment and materials, delivery of gravel for construction of the roads and substation platforms, delivery of raw material for batching concrete and delivery of wind turbine components (mostly via abnormal loads). It also includes the dispatching of concrete for turbine foundations which is an intensive but short term activity (five individual days for Zone 2, five individual days for Zone 3, five individual days for Zone 4 and two individual days for Zone 5). Diurnal traffic is proposed by seven vehicles per hour, which are distributed over the various roads. The maximum additional trips on any road within an hour will never exceed seven.

Table 6.69 below indicates the routes that would be impacted during specific times of the day.

Table 6.69: Roads affected by construction phase traffic

Time	Road
Peak traffic	DR01761; DR01762; DR01763-1&4; DR01765-1,2&3; DR01774- 2&3; DR01779- 1,2&3; MR00389; MB50032-1&2, TR04403
Diurnal traffic	TR04403, DR01765-1, DR01779-3, MN50032

6.13.1.3 Road network affected during operation

Vehicular traffic during operation will include the commuting of approximately 32 staff during peak hours. It is envisaged that during peak traffic staff are transported by means of five light vehicles and two minibuses. The proposed routes would be via the TR04403 and DR01779-2&3. The maximum number of additional vehicles on any road within one hour will never exceed seven.

Operational activities include the monitoring, routine servicing and unscheduled maintenance of the wind turbines. Activities that generate traffic include daily inspections and periodical maintenance of the wind turbines and associated infrastructure. This will contribute to diurnal traffic and generate approximately four trips per day. These trips are expected to generate from Humansdorp. The maximum number of additional vehicles on any road within an hour will never exceed two.

Table 6.70: Roads affected by operational phase traffic

Time	Road
Peak traffic	DR01765-1; DR01779-3; MN50032-2; TR04403
Diurnal traffic	DR01764; DR01765-1; DR01774-1; DR01779-3; MN50032-1&2; TR04403

6.13.2 Site sensitivity

Accordance with Technical Recommendations for Highways (TRH) 26 the annual average daily traffic (AADT) for which the various Rural Functional Road Classifications have been designed are as follows:

- Class 1 road (principal arterial road) is in the order of 1,000 to 100,000;
- Class 2 road (major arterial road) is in the order of 500 to 25,000;
- Class 3 road (minor arterial road) is in the order of 100 to 2,000;
- Class 4 roads (collector roads) is less than a 1,000; and
- Class 5 roads (local roads) is less than 500.

The average daily traffic on the provincial paved roads within the study area are below 500 except for two roads namely TR04403 and MR00391 which have an average daily traffic of between 500 and 2,000.

The average daily traffic on the provincial unpaved roads within the study area are all below 100 except a section of DR01774-2, DR01774-3 and MN50092, on which the average daily traffic was found to be between 100 and 250 and a section of DR01763-5 (between MR00381 and MN50361), on which the average daily traffic was found to be more than 500.

6.13.3 Impact Assessment with mitigation

Traffic impacts cane be expected during construction and operation of the proposed project. A new assessment would be required for the decommissioning phase at that time.

The most significant impacts considered identified are:

- Construction and operational increases in traffic volumes resulting in deterioration of road conditions;
- Construction increases in traffic for the delivery of concrete; and
- Construction and operational increases in traffic volumes and associated incidents.

As part of the decommissioning process a separate traffic impact assessment should be undertaken, since many of the characteristics related to the traffic impact assessment, i.e. access routes, road geometry, traffic volumes, etc. would have changed over the operational life of the development. Thus, a specific decommissioning assessment has not been undertaken at this stage.

Table 6.71: Construction impacts: deterioration of road condition due to increased traffic volumes

Phase		**Construction**		
Impact description	During the construction phase of the development, there will be an increase in the traffic volumes on the local road network. The increase traffic volumes will place an additional burden on the roads within the study area. The paved roads, which service this development are narrow, with overgrown shoulders. The roads are overstressed with significant signs of degradation, including cracking and edge breaks. The unpaved roads are in a poor to very poor condition, resulting from nominal to no maintenance been undertaken. Therefore there is the potential for deterioration of the road network due to the increase in traffic volumes.			
	Without mitigation		**With mitigation**	
Nature	Negative		Positive	
Duration	Short term		Short term	
Extent	Local		Local	
Intensity	Moderate		Low	
Significance	**MINOR (-)**		**MINOR (+)**	
Probability	Probable		Probable	

Confidence	Medium	Medium
Reversibility	High	High
Resource irreplaceability	Low	Low
Mitigation measures		
• Create local WhatsApp Group and post notices of road conditions and propose alternatives. • Developer to contribute to the maintenance of the public roads in the area during construction phases of the development • A photographic record of the road condition should be maintained throughout the various phases of the development. This provides an objective assessment and mitigates any subjective view from road users. • Upgrade unpaved roads to suitable condition for proposed construction vehicles; • Ensure that the roads are left in same or better condition, post-construction.		

Table 6.72: Construction impacts: incidents due to increased traffic volumes

Phase		**Construction**		
Impact description	During the construction phase of the development, there will be traffic-related impacts on the local road network. The increase traffic volumes will increase the potential of incidents on the roads within the study area. Based on experience of similar developments within the area, the peak traffic will be more affected than during the rest of the day. Most of the traffic related to the proposed development is associated with the transportation of the site personnel to and from the site, making use of light vehicles. The traffic related to the delivery of material and equipment to site is larger but less frequent as this traffic is dispersed over a longer period. Traffic relating to the concrete pouring of the turbine foundation are addressed separately.			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term		Short term	
Extent	Local		Local	
Intensity	Moderate		Moderate	
Significance	**MINOR (-)**		**NEGLIGIBLE (-)**	
Probability	Probable		Unlikely	
Confidence	Medium		Medium	
Reversibility	High		High	
Resource irreplaceability	Low		Low	
Mitigation measures				
• Post relevant road signage along affected routes. • Create local WhatsApp Group, notifying users of expected deliveries and propose alternative routes. • A Transport Management Plan (TMP) is to be compiled once the contractor has been appointed and all the relevant details of the construction process are known. The TMP needs to address, *inter alia*: - clearly define route to site for specific vehicles needed to transport equipment and materials; and - schedule delivery to avoid local congestion. • Ensure all vehicles are roadworthy, visible, properly marked, and operated by an appropriate licensed operator.				

Table 6.73: Construction impacts: delivery of concrete

Phase		Construction		
Impact description	The transportation of concrete, on the public roads, required for the casting of the wind turbine foundations, has been minimised as far as possible. However, due to the layout of the turbines on the sites, traversing and travelling on the existing road network is unavoidable. The casting of the turbine foundations are isolated activities, that occur over a very short period, which normally does not extend more than eight-hours.			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	Immediate		Immediate	
Extent	Local		Local	
Intensity	Extremely High		Extremely High	
Significance	**MODERATE (-)**		**MINOR (-)**	
Probability	Definite		Highly probable	
Confidence	High		High	
Reversibility	High		High	
Resource irreplaceability	Low		Low	
Mitigation measures				
• A Transport Management Plan (TMP) is to be compiled once the contractor has been appointed and all the relevant details of the construction process are known. The TMP needs to address, *inter alia*: - clearly define route to site for specific vehicles needed to transport equipment and materials' - schedule delivery to avoid local congestion; • Create local WhatsApp Group, notifying users of expected deliveries and propose alternative routes; • Minimized non-essential deliveries during the casting of turbine foundations. • Temporary close roads where possible. • Provide advance driver training to key personnel, including truck drivers. • Where trucks cross public roads, provide maned crossing, post relevant road signage along affected routes and reduce speed limit on the relevant section of the road. • Ensure all vehicles are roadworthy, visible, properly marked, and operated by an appropriate licensed operator.				

Table 6.74: Operational impacts: deterioration of road condition due to increased traffic volumes

Phase			Operation	
Impact description	During the operational phase of the development, there will be a reduced increase in the traffic volumes on the local road network. The traffic volumes will be limited to peak traffic with nominal diurnal traffic generated. The size of the vehicle will be limited to light delivery vehicles with occasional heavy vehicles, which will induce a minor burden on the roads within the study area. Mitigation of this impact would be regular maintenance of the roads by the local roads' authorities. However, due to budget constraints it is unlikely that the necessary road maintenance will be undertaken.			
	Without mitigation		**With mitigation**	
Nature	Negative		Positive	
Duration	Permanent		Permanent	

Extent	Local	Local
Intensity	Moderate	Low
Significance	**MINOR (-)**	**MINOR (+)**
Probability	Probable	Probable
Confidence	Medium	Medium
Reversibility	High	High
Resource irreplaceability	Low	Low
Mitigation measures		

- Create local WhatsApp Group and post notices of road conditions and propose alternatives.
- Developer to contribute to the maintenance of the public roads in the area during operation phases of the development.
- A photographic record of the road condition should be maintained throughout the operational phase of the development. This provides an objective assessment and mitigates any subjective view from road users.
- Upgrade unpaved roads to suitable condition for proposed construction vehicles.
- Ensure that the roads are left in same or better condition, post-construction.

Table 6.75: Operational impact: incidents due to increased traffic volumes

Phase			**Operation**	
Impact description	During the operational phase of the development, there will be a nominal increase in traffic on the local road network. The traffic volumes will be limited to peak traffic with minimal diurnal traffic generated. Although, there is a nominal increase in the traffic volumes there is always a potential of incidents on the roads within the study area.			
	Without mitigation		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent		Permanent	
Extent	Local		Local	
Intensity	Moderate		Moderate	
Significance	**MINOR (-)**		**NEGLIGIBLE (-)**	
Probability	Probable		Unlikely	
Confidence	Medium		Medium	
Reversibility	High		High	
Resource irreplaceability	Low		Low	
Mitigation measures				

- Post relevant road signage along affected routes.
- Create local WhatsApp Group, notifying users of expected deliveries and propose alternative routes.
- Transport Management Plan is to be revised for the operational phase of the development.
- Ensure all vehicles are roadworthy, visible, properly marked, and operated by an appropriate licenced operator.

6.13.4 No-Go alternatives

If the No-Go scenario was to be considered, given the current condition of the road and lack of road maintenance due to budgetary constraints within various spheres of government, the community would be worse off. The developer has a social obligation to maintain the roads used during the various phases of the development. Thus, a No-Go scenario would be a missed opportunity to uplift the community by maintaining the road network, used by the developer. The significance of this impact is considered Moderate negative without mitigation and Minor positive with mitigation.

6.13.5 Conclusion and recommendations

The TIA indicates that the road conditions vary between fair to poor and will further deteriorate, the expected traffic on the roads during the construction phase will lead to greater wear and tear. It is strongly suggested that the developer contribute towards the maintenance of the public road network that is affected by the development. The final route selection is subject to the limitations specified in the transport permit and the transportation vehicles used by the appointed logistics company. Previously established transportation routes from the Ngqura Container Terminal, near Port Elizabeth, to the existing wind farms in the study area, will be used for the transportation of equipment and material, including abnormal loads. In terms of traffic volumes, the most significant impact on traffic is as a result of commuting the personnel to and from site. At no point during the construction or operation does the traffic volume on the various roads exceed fifty trips per hour, which is the threshold set out in the "South African Traffic Impact and Site Traffic Assessment Manual". Based on the Traffic Density the theoretical distance between vehicles on the road network is never less than one kilometre, in the cumulative scenario which is above the acceptable distance of 250 to 400 metres for roads with a LOS C.

A Traffic Management Plan (TMP) is required and needs to address:

- Specific traffic management measures across all phases of the development;
- Measures to minimize impacts on existing road users;
- Define the repair and maintenance strategy to be adopted; and
- Schedule deliveries by heavy vehicles to avoid the formation of a convoy, sufficient distance must be maintained to allow light vehicles to overtake safely.

The developer shall ensure that the contractor provides training to the driving personnel to minimize potential incidents and that the roads impacted by the development is left in the same conditions or better after the construction phase. Temporary signs warning motorists of construction vehicles should be erected on the approaches to the access road and vegetation needs to be cleared on the approaches to intersections.

It can be concluded that the development of the project will have a notable increase in traffic volumes on the road network, however this assessment has found that current road network is operating at well below its capacity and provides adequate level of service. It is of the opinion of the specialist that the development can be approved from a traffic and transportation perspective, since there are no constraints nor notable impacts would jeopardise the implementation of the development, subject to the specific requirements included within this report.

6.14 Wake effect

As already described in Section 1.2, the Impofu Wind Farms are located on a section of coastal plain with the ocean on either side which results in excellent wind conditions and low levels of turbulence, making it one of the best wind resources in the country and ideal for wind farm development. For this reason, there are a number of existing and planned wind farms in this area (refer to Figure 7.2).

During the previous PPP activities, it was raised as an issue by neighbouring wind farms that the proposed Impofu Wind Farms could impact the energy yield of neighbouring wind farms through wake effect. Red Cap subsequently appointed Africoast Energy, to assess these potential impacts on the yields of the adjacent wind farms. Only the existing Kouga Wind Farm and the existing Tsitsikamma Community Wind Farm were assessed (refer to Appendix E11). This study was shared with these two wind farms and discussions started to find a fair

and amicable solution. The existing Gibson Bay Wind Farm and the approved Oyster Bay Wind Farm (construction to start in 2019) are owned by Enel Green Power, who are developing the Impofu Wind Farms in partnership with Red Cap, and it was agreed that these impacts could be addressed internally.

6.14.1 Assessment and mitigation

The energy yield of these two wind farms were modelled without the Impofu Wind Farms, and modelled with the Impofu Wind Farms. The difference was measured as a percentage and depicted in Table 6.76:

Table 6.76: Loss in production due to the wake effect of the proposed Impofu Wind Farms

Kouga Wind Farm	Tsitsikamma Community Wind Farm
0.93%	1.60%

The mitigation measures in Table 6.77 have been applied during the process and as part of this study.

Table 6.77: Reduction in wake effect with various mitigation measures

Mitigation measures applied	Kouga Wind Farm	Tsitsikamma Community Wind Farm
Avoiding the placement of turbines within 1 km from existing wind turbines (*already applied*)	0.93%	1.60%
Altering the layout during the EIA process (*already applied*)	0.93% (reduced from 1.07%)	1.6% (reduced from 1.85%)
Varying the turbine heights	0.91% (best case scenario)	1.55% (best case scenario)
Removal of worst impacting turbines	0.74 % (remove turbine 30 from East; but reduces Impofu output by 3%)	1.41% (remove turbine 26 & 29 from North; but reduces Impofu output by 6%) 1.08% (remove 7 worst turbines from North; but reduces Impofu output by 21%)

The most significant reductions are as a result of removing selected turbines from the Impofu Wind Farms layout, however this affects the viability of the Impofu Wind Farms because it reduces the total generation capacity (in MW).

6.14.2 Conclusions and recommendations

For Kouga Wind Farm, the most significant measure was to remove turbine 30 from Impofu East Wind Farm. It is recommended that Kouga Wind Farm and Red Cap discuss this further taking into account their respective losses.

For Tsitsikamma Community Wind Farm, removing seven of the worst turbines would have a significant impact on the viability of the Impofu Wind Farms when considered in the context of the reduction (only 1.08%). It is therefore recommended that Red Cap engage Tsitsikamma Community Wind Farm to enter into a commercial agreement, which is fair to both parties, to reduce the loss of income to Tsitsikamma Community Wind Farm due to the wake effect from Impofu Wind Farms, to a fair level.

Discussions have started between the Impofu Wind Farms and the Tsitsikamma Community Wind Farm and Kouga Wind Farm and these are ongoing with the aim to find a fair and amicable solution to the potential wake effect.

7 Cumulative impact assessment

The cumulative impacts of the Impofu West Wind Farm are an important consideration for the project given the context of the current wind farm proposals including Impofu North and Impofu East Wind Farms, as well as proposed wind farm projects, within the existing renewable energy landscape.

Cumulative impact, in relation to an activity, means the past, current and reasonable foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may be significant when added to the existing and reasonable foreseeable impacts eventuating from similar or diverse activities (NEMA EIA Reg 1).

7.1 Approach

A number of scenarios have been described to show how this project in conjunction with the past, present and future wind farm projects in the area has the potential for cumulative impacts on the same environmental receptors. The area of influence of the cumulative study was a 30 km radius around the Consolidated Impofu Wind Farm site and this was agreed at the Pre-Application meeting with DEA (17 October 2017). It was agreed that for future wind farms, only those that have a valid environmental authorisation and/or are currently under construction should be included as there is a level of certainty that they will be developed. The increasing levels of impacts from past, present and future wind farm projects that have informed the cumulative assessment as part of the environmental impact assessment process are as follows:

A Existing baseline which includes the operational Kouga, Gibson Bay, Tsitsikamma and Jeffrey's Bay Wind Farms. Specialists have considered the baseline in their respective baseline descriptions in Section 6.

B Assessment of impacts of the Impofu West Wind Farm on the existing baseline. Specialists assessment of these impacts are presented in Section 6.

C Assessment of impacts from Impofu West Wind Farm on the baseline, in combination with the impacts of Impofu North and Impofu East Wind Farms. **This is SCENARIO 1** and the specialists assessment of this is presented in Table 7.2 in this Section.

D Assessment of cumulative impacts from all three Red Cap wind farms and associated infrastructure on the baseline in addition to the proposed Oyster Bay, Banna Ba Pifhu and Ubuntu Wind Farms which are within a 30 km radius from the consolidated site and have a valid environmental authorisation. **This is SCENARIO 2** and the specialists assessment of this is presented in Table 7.2 in this Section.

The various levels forming the impact assessment process are conceptually represented on Figure 7.1 below. The projects and their details are included Table 7.1 and depicted spatially on a map as Figure 7.2.

Table 7.1: Adjacent proposed wind farms considered in the EIA process

Scenario		Wind Farm	Turbines and MW	Status
1	2	Kouga Wind Farm and associated powerline	32 (2.5 MW); Total: 80 MW	Operational
1	2	Gibson Wind Farm and associated powerline	37 (3 MW); Total: 111 MW	Operational
1	2	Tsitsikamma Community Wind Farm and associated powerline	31 (3.075 MW); Total: 95.33 MW	Operational
1	2	Jeffreys Bay Wind Farm	60 (2.3 MW); Total: 138 MW	Operational
1	2	Impofu West Wind Farm	29 (3 – 6 MW); Total: 174 MW	Subject of this S&EIA process
1	2	Impofu North Wind Farm	33 (3 – 6 MW); Total: 198 MW	Subject to a separate S&EIA process
1	2	Impofu East Wind Farm	33 (3 – 6 MW); Total: 198 MW	Subject to a separate S&EIA process
	2	Oyster Bay Wind Energy Facility and associated (4.3 km) powerline	41 (3.6 MW); Total: 140 MW (contracted capacity)	EA; Construction to commence in 2019
	2	Ubuntu Wind Energy Project[14]	31 – 50; Total: 100 MW	EA (EA expires 13 June 2019)
	2	Banna Ba Pifhu Windfarm Project	9 – 17; Total: 30.6 MW	EA

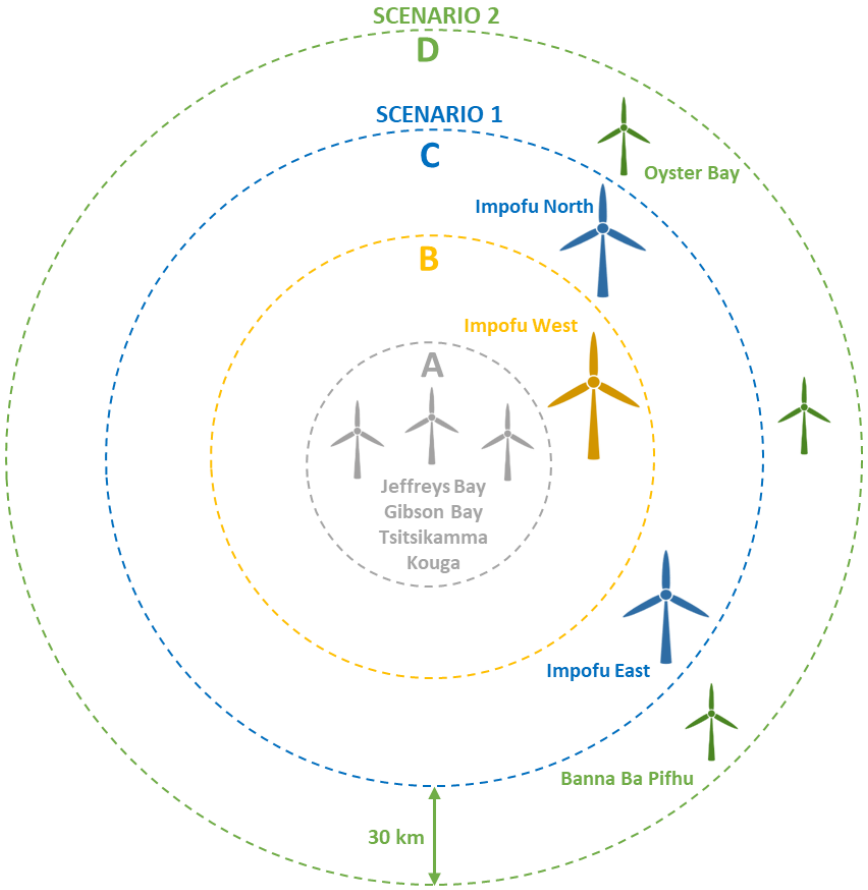


Figure 7.1: Impact assessment process

[14] It is unlikely that Ubuntu Wind Farm will have a valid EA after June 2019 which is the expiry date. The reason for this is that after the project was approved it was found that there were high numbers of Black Harriers present on the site around the proposed turbine positions at certain times of year. The applicant may therefore chose not to extend the validity of the EA on this basis.

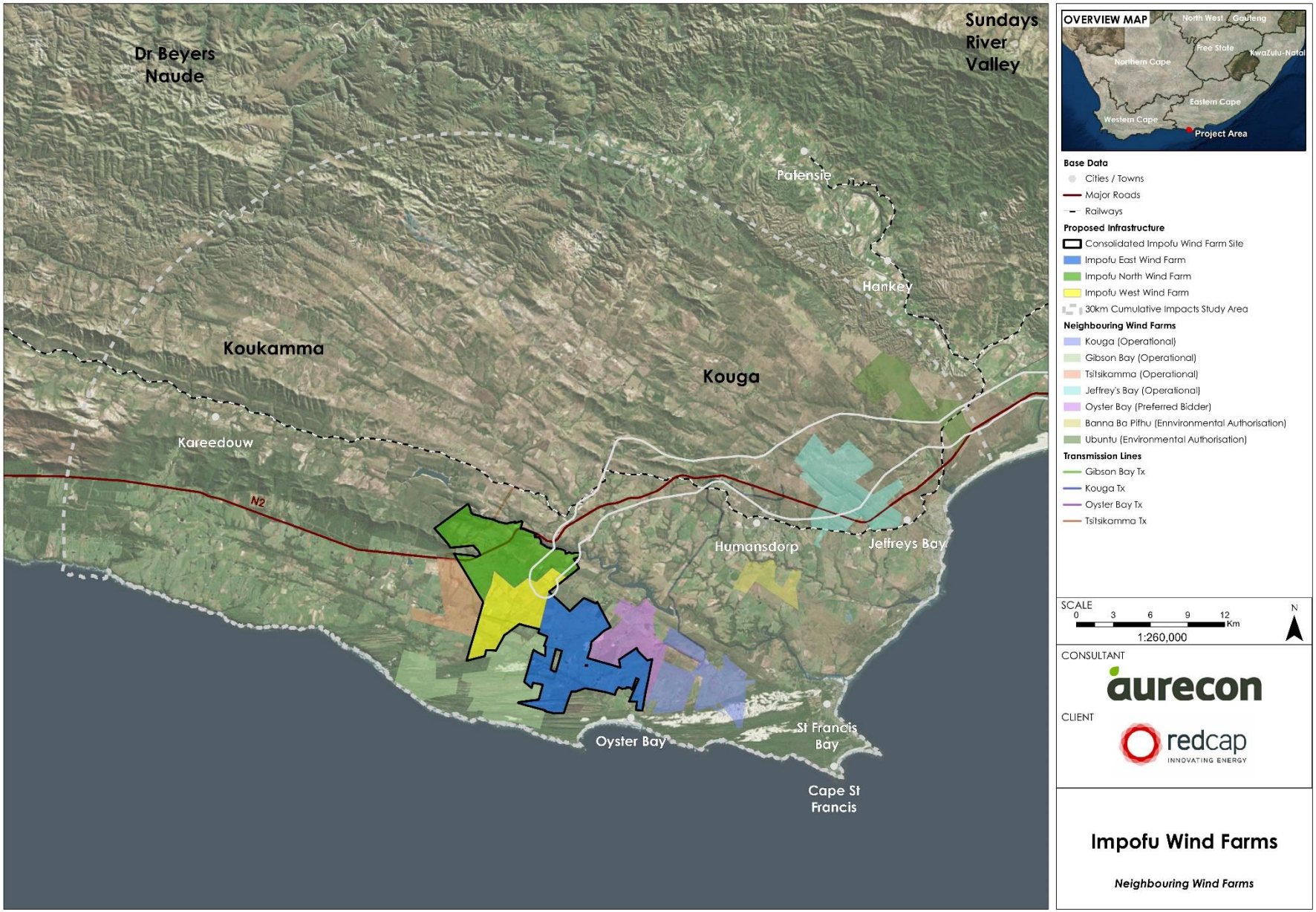


Figure 7.2: Existing and proposed adjacent projects considered in the impact assessment

The cumulative assessment involved the following:

1. Dissemination of the following to the specialists:
    a. A map showing the other identified existing and proposed wind farms in the study area.
    b. Environmental assessment reports for the identified wind farms.
    c. Turbine locations and specifications were sourced for identified wind farms where necessary e.g. for noise and shadow flicker modelling, and viewshed modelling.
2. Where available, pre-construction and operational monitoring data was also accessed by specialists (avifauna and bats specifically) to assist with identification of the baseline (as described in Section 6) as well as the impacts incurred by the other proposed wind farms that were identified. It should be noted that many of the specialists were also authors of some of the other studies in the area and therefore already have considerable knowledge of the area and access to monitoring data.
3. Specialists assessed the two cumulative scenarios in their studies and where applicable considered whether impacts would exceed an acceptable threshold relevant to their discipline. Where quantification was possible this was undertaken, and in some cases assumptions had to be made regarding the other wind farms where equivalent quantitative information was not available.
4. The specialists reported on the cumulative impacts in their reports (Appendix E) and a summary of the findings is presented below in Table 7.2.

7.2 Assessment

The findings from the various specialist studies are summarised in Table 7.2, the impacts are detailed further in their specialist reports included in Appendix E.

For the purposes of consistency, low is considered synonymous with minor and high is considered synonymous with major, in such instances an Asterix has been used (*).

Table 7.2: Summary of potential cumulative impacts

Aspect	Description of impact	Significance of cumulative impacts
Terrestrial ecology	Impact on broad-scale ecological processes	**Scenario 1 & 2 - Moderate negative pre-mitigation reduced to minor negative post-mitigation** The assessment focused on the vegetation types that were lost as a result of the developments and the level of transformation thereof. Regardless of vegetation type, the loss of vegetation also impacts ecological processes such as dispersal ability of fauna and flora and the ability of fauna and flora to respond to climatic fluctuations. It was found that the current development would potentially contribute to further cumulative impacts on habitat loss and fragmentation and negatively impact on broad-scale ecological processes such as dispersal and climate change resilience. However, the level of cumulative impact which can be attributed to wind farm development within the area remains low and the further contribution of the current development would also be low and is facilitated by the extensive avoidance that has been implemented by the developer. The total extent of habitat loss from all three Impofu Wind Farms is estimated at less than 20 ha of Tsitsikamma Sandstone Fynbos and less than 10 ha 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 degraded areas.

Aspect	Description of impact	Significance of cumulative impacts
		Mitigation: Implementation of site specific mitigation namely erosion control, alien plant control and contribution to the Greater Kromme Stewardship Initiative. Also avoidance of restricted and specialised habitats (wetlands and dunes) and minimising the development footprint as far as possible – both of which have already been implemented for this project.
Aquatic ecology	Impacts to the aquatic environment	**Scenario 1 & 2** – **Negligible negative pre-mitigation to minor positive post-mitigation** Only projects in the same catchment were considered applicable. Presently, no significant cumulative impacts with regard to the proposed turbine placement, hardstands and associated underground cabling were identified as these are also located outside of the delineated aquatic systems and their buffers for the proposed site (i.e. out of the identified No-Go areas). The potential cumulative impacts of this wind farm would only result should additional impacts proposed by the layout affect the aquatic environment. However, with the exception of the few internal crossings within already degraded areas, the wind farm itself would not add any additional impacts. The project has the potential to have a positive impact should any of the watercourse crossings and wetland area near the infrastructure required be rehabilitated. **Mitigation**: Implementation of site specific mitigation (namely the development and implementation of a wetland and watercourse rehabilitation plan post environmental authorisation). This could also be integrated into any further plans or strategies that groups such as the Greater Kromme Stewardship Project develop.
Bats	Destruction of foraging habitat by clearing vegetation	**Scenario 1 & 2 – Minor negative pre-mitigation to negligible negative post-mitigation** More turbines will result in a larger area being transformed. However, the habitat transformations remain significantly dispersed even when several wind farms are considered. Due to the layout avoiding sensitive areas, the critical bat habitat remains untransformed and provide continuous habitat with neighbouring wind farms. **Mitigation**: Implementation of site specific mitigation, namely to rehabilitate cleared vegetation where possible at areas such as laydown yards.
	Bat mortalities due to moving turbine blades	**Scenario 1 & 2 – High moderate* negative pre-mitigation to low moderate* negative post-mitigation** Selection of the relevant wind farms for inclusion in the cumulative assessment took into account the ecoregions, topography and land use, with the assumption that the watercourses and riparian habitats allow for continuous natural bat foraging habitat and movement corridors through the wind farm sites. The SABAAP Bat Threshold Document (MacEwan, *et a*l., 2018) provides guidelines on acceptable sustainable mortality thresholds for a wind farm, this was calculated for each of the Impofu Wind Farms. Estimator bat fatalities were then calculated for the four operational wind farms. It was found that two of these are already above the threshold and two remain below the threshold. Sustainable thresholds were calculated for each cumulative scenario by application of the same guidance (MacEwan, *et al*., October 2018). This was compared to the total estimated fatalities (the thresholds for each proposed wind farm plus the estimators for each operational wind farm). For Scenario 1 and 2 it was found that the estimated fatalities were well below the sustainable cumulative thresholds (40% and 46% respectively).

Aspect	Description of impact	Significance of cumulative impacts
		Although it is logical to deduce that additional turbines in an area will increase the cumulative bat mortalities for that area, it is noted that cumulative wind farms occupy a larger area which also means the applicable bat populations will be larger. Therefore, the model of considering the cumulative total area of turbine influence and an acceptable sustainability threshold of fatalities per year is used. The layout of the proposed Impofu West Wind Farm is not particularly compact, increasing the area of turbine influence considerably during the cumulative assessment and thereby allowing more unmodified foraging space for bats. No migration routes have been identified in the preconstruction and operational studies in the area, additionally the species composition is dominated by resident non-migrating bats. *T. aegyptiaca* has a wider foraging range and may therefore be more prone to cumulative impacts than *N. capensis*. The cumulative assessment implies that as long as the proposed project, and the other wind farms that are not yet operational, remain below sustainable mortality thresholds, the cumulative impacts for the area will be acceptable in all the cumulative scenarios. **Mitigation**: Site specific mitigation for the project applies (i.e. initial curtailment, followed by adaptive management / mitigation based on the operational data). It remains the responsibility of each wind farm to lower their estimator fatalities below the acceptable sustainability thresholds when bat fatalities are unsustainably high, which will lower the overall cumulative impact of all wind farms in the area.
	Bat mortalities due to light attraction	**Scenario 1 & 2** – **Moderate negative** pre-mitigation to **minor negative** post-mitigation Lighting attracts insects and therefore increases insectivorous bat activity and potential mortality from the blades. Increasing the likelihood and therefore annual bat fatalities of a wind farm will naturally increase the cumulative effect in a larger area, especially if several wind farms are causing this same impact. However, simple and cost-effective mitigations will lower this impact cumulatively. **Mitigation**: Site specific mitigation for the project applies, namely motion sensor lighting and designed as downhooded.
Avifauna	Destruction and alteration of habitat	**Scenario 1 – Moderate negative significance** Approximately 201.7 ha of habitat was transformed by the four operational facilities which is considered to be a relatively small amount of habitat transformation given the scale of the projects and amount of energy production. In addition, since these species (Denham's Bustard, Blue Crane, White-bellied Korhaan, White Stork) are using transformed habitat which is not particularly unique or limited in this area, this reduces the significance of this effect. It is estimated that the consolidated Impofu Wind Farms will transform approximately 119.7 ha. The effect of large dispersed infrastructure projects such as wind farms on birds is likely to be far more complex through factors such as habitat fragmentation, disruption of territories and other factors. These effects have however proven extremely difficult to measure. In order to apply a cautious approach the specialist concludes that the overall cumulative significance of habitat destruction in this area by wind farms is moderate, and that the contribution by Impofu Wind Farms to this impact is low to moderate. **Mitigation**: Project specific mitigation namely walkthrough for final layout and general environmental best practice during construction.
		Scenario 2 – Moderate negative significance

Aspect	Description of impact	Significance of cumulative impacts
		The three authorised wind farms will transform an additional estimated 133.6 ha to Scenario 1. This brings the total habitat transformation by wind farms in the area to 455 ha. In order to apply a cautious approach the specialist concludes that the cumulative significance of habitat destruction in this area, including the Impofu Wind Farms and planned wind farms, is moderate, and that the contribution by Impofu Wind Farms to this impact is moderate. **Mitigation**: Project specific mitigation namely walkthrough for final layout and general environmental best practice during construction.
	Displacement of birds from the site	**Scenario 1 & 2 – Low* negative significance** No displacement impacts have been recorded at the operational wind farms. The project specific impacts are of negligible negative significance. In addition to Scenario 1 it was found that the additional three proposed wind farms could individually result in potential displacement of certain species e.g. White-bellied Korhaan (only identified at Banna ba Pifhu), Denham's Bustard (Banna ba Pifhu and Ubuntu) and Blue Cranes (Oyster Bay). Overall it is concluded that the cumulative impact of displacement of birds by wind farms in the Kouga area for both scenarios is of low significance and the contribution to this by the Impofu Wind Farms is low. **Mitigation**: Project specific mitigation namely walkthrough for final layout and monitoring of Martial Eagle nest during breeding seasons.
	Disturbance of breeding during construction and/or operations	**Scenario 1 & 2 – Low* negative significance** Similarly, to above for displacement, it is concluded that the cumulative impact of displacement of birds by wind farms in the Kouga area is of low significance and the contribution to this by Impofu Wind Farms is low. The three authorised wind farms' avifaunal assessments did not discuss disturbance separately to displacement. **Mitigation**: Project specific mitigation namely monitoring of Martial Eagle nest during breeding seasons.
	Direct mortality of birds through collision with turbines	**Scenario 1 – High* negative significance** Operational fatalities of the four operational wind farms amount to 30.07 per year, and the Impofu Wind Farms would add an estimated 17.19 birds to bring the cumulative total fatalities of priority species to 47.26 birds per year. The three Impofu Wind Farms' fatalities amount to 36.37% of the total cumulative fatalities. Of these fatalities approximately half are Red Listed bird species (Denham's Bustards, Blue Cranes, Black Harriers and African Marsh-Harriers). Therefore, it was found that the cumulative turbine collision impact of wind farms on the priority bird species in the Kouga area is high. The contribution by the Impofu Wind Farms to the cumulative impact is high if all three wind farms are built but this is the worst-case scenario. Reasons being that this analysis does not take account of the avoidance measures already implemented at Impofu Wind Farms, which would reduce collision fatalities; and that experience across multiple operational wind farms has been that actual fatality rates are lower than those predicted during impact assessment. **Mitigation**: Project specific mitigation namely walkthrough for final layout, contribution to the Greater Kromme Stewardship initiative and a contingency budget for mitigation.
		Scenario 2 – High* negative significance In addition to Scenario 1, the three additional wind farms would add a further 9.66 fatalities per year to the 47.26 fatalities for Scenario 1 bringing it to 56.92 per year. The contribution of Impofu Wind Farms to

Aspect	Description of impact	Significance of cumulative impacts
		the estimated cumulative impact of estimated priority bird fatalities is 30.2%. Based on these figures it was concluded that the cumulative turbine collision impact of wind farms on the priority bird species in the Kouga area is high. In addition to the factors considered by Scenario 1, it was also taken into account that turbine models for the other three proposed wind farms could also be amended to incur greater impacts than originally assessed. **Mitigation**: Project specific mitigation namely walkthrough for final layout and contingency budget for mitigation.
	Combined cumulative impact on birds	**Scenario 1 – Moderate negative significance**
		Scenario 2 – Moderate negative significance
Agriculture	Loss of agricultural land and associated agricultural potential	**Scenario 1 & 2 – Minor negative significance** The loss of these small proportions of productive land from the individual farms is insignificant in terms of the reduction in the agricultural output of those farms. If it is insignificant for each individual farm, then the cumulative impact on production for a number of wind farms is also insignificant, because the cumulative impact is the same proportion as the individual impact. **Mitigation**: Project specific mitigation, namely consultation with farmers on any designs.
	Increased financial security for farming operations	**Scenario 1 & 2 – Moderate positive significance** Income earned by the individual farmers from the turbines on their land may benefit farming operations and increase investment into agricultural infrastructure, and thereby improve agricultural production levels. This benefit will be of moderate positive significance. **Mitigation**: Project specific mitigation, namely consultation with farmers on any designs.
Socio-economic	Overall socio-economic impact	**Scenario 1 & 2 – Positive significance** The net effect of the proposed project from a socio-economic perspective during both the construction and operational phases would be positive. Under both Scenario 1 and Scenario 2 the same type of impacts will arise. This includes stimulation of local and national economy (moderate positive), job creation (moderate positive), increase in household earnings (minor positive), and increase in government revenue (minor positive) with some negative impacts being change in sense of place (moderate negative), impact on property and land value (negligible negative), and impacts to social and economic infrastructure from the influx of people to the area (minor to negligible negative with mitigation). Other than the latter, all of these impacts remain the same with mitigation. Scenario 1 will be of greater significance than for the Impofu West Wind Farm and Scenario 2 will be greater than Scenario 1. **Mitigation**: Project specific mitigation applies.
Archaeology	Impact on the Pre-colonial landscape along 5 km wide coastal strip	**Scenario 1 & 2 – Major negative significance pre-mitigation reduced to minor to negligible negative post-mitigation** The 5 km coastal strip is the most sensitive area pertaining to the project in terms of aesthetic and visual value of the natural and cultural landscape and buried heritage resources. However, all undisturbed portions of this strip were avoided by adherence to the No-Go area proposed by Eastern Cape Heritage Consultants (Binneman and Reichert, 2017) and further expanding this No-Go area. This mitigation along with the fact that the proposed Impofu Wind Farms will be situated in an existing and growing renewable energy landscape with numerous

Aspect	Description of impact	Significance of cumulative impacts
		wind turbines in the immediate surroundings significantly reduces this potential impact. There still may be sensitive archaeological sites outside of this No-Go area and any impact to a significant site would increase the cumulative impact on the archaeology in the area. Hence, monitoring is recommended in areas considered to be potentially more sensitive to minimise any such potential impact. **Mitigation:** Remaining out of the undisturbed portions of the coastal strip along with site specific mitigation namely archaeological monitoring during construction (south of the dashed line on Figure 6.28).
	Impact on surrounds of quarry with in situ ESA and MSA stone artefacts	**Scenario 1 & 2 – Major negative significance pre-mitigation reduced to negligible negative post-mitigation** Excavations during construction may disturb or destroy Stone Age artefacts such as those found in the Impofu West Wind Farm (such as the quarry site at IW7). Overall the cumulative impact is considered to be negligible as archaeological monitoring is proposed to reduce any significant impacts. **Mitigation**: Site specific mitigation namely archaeological monitoring during construction (within the dashed ellipse on Figure 6.28).
	Improved record of archaeological material	**Scenario 1 & 2 – Minor positive significance** The impact assessments required for these developments have greatly improved our record and understanding of archaeological material in the area and have provided an opportunity to conserve them for present and future generations. This is not possible if uncontrolled piecemeal developments as well as natural processes were to take place. **Mitigation**: Site specific mitigation namely archaeological monitoring and also consultation with the relevant authorities should archaeological or palaeontological resources, or graves, be encountered.
Noise	Construction noise impacts	**Scenario 1 & 2 – Minor negative** If all three wind farms are constructed at the same time, the cumulative impact will not be significantly different to the impact from one wind farm as constructing more wind farms will not cause more concentrated or greater noise sources on community receptors but will rather spread the noise over a greater area. **Mitigation**: Site specific mitigation namely general best practice for equipment, vehicles and distribution of works across the site.
	Operational noise impacts	**Scenario 1 & 2 – Not significant** For Scenario 2, only the proposed Oyster Bay Wind Farm was close enough to be considered additional. The modelling depicted that no additional sensitive receptors, besides those 13 identified within the Tsitsikamma Community Wind Farm are located within the 45 dB(A) noise contour. These receptors would experience further noise increases which are imperceptible as the increases are anticipated be less than 3 dB(A). This is similar for both scenarios. Therefore, noise levels are met and no cumulative effects anticipated. **Mitigation**: None required.
Shadow flicker	Shadow flicker impacts	**Scenario 1 & 2 – Minor negative significance** For Scenario 2, only the proposed Oyster Bay Wind Farm was close enough to be considered as part of the cumulative assessment. The modelling depicted that all receptors that are expected to be impacted are located within the consolidated Impofu Wind Farm site. There are 61 receptors potentially impacted by the consolidated Impofu Wind Farm site, with an additional 33 for Scenario 1 and an additional 4 for

Aspect	Description of impact	Significance of cumulative impacts
		Scenario 2. Even though the number of exceedances are high, with mitigation, the impact is considered minor negative significance. **Mitigation**: Site specific mitigation namely undertaking of measurements during operation and application of mitigation where necessary (e.g. screening).
Visual	Visual impact	**Scenario 1 & 2 – Moderate negative significance for turbines and related infrastructure; moderate-minor negative for lighting and minor negative for decommissioning** Both scenarios would result in a change to the character of the area, particularly viewed from Oyster Bay and surrounding farmsteads. However, existing wind turbines are already visible from these areas. Where wind farms are grouped together, as in the case of the study area, viewsheds would tend to overlap to some degree, particularly as the proposed Impofu West Wind Farm can be seen as an infill wind farm in relation to the surrounding existing wind farms. **Mitigation**: Site specific mitigation namely with regards to lighting design, screening and limiting signage and rehabilitation.

7.3 Cumulative impact statement

The impacts of the proposed project in combination with the other Impofu Wind Farm projects, and past, present and future wind farm proposals in the study area have been assessed for each specialist discipline, refer to Table 7.2. The cumulative impacts depend largely on whether the project specific mitigation that has been identified in Section 6 can be applied. Many of the impacts were rated as negligible or minor negative significance, however there were a few negative moderate impacts of concern and one high residual impact, which are discussed below along with some key mitigation measures.

Although the impact on avifauna mortality from turbine collisions has been rated to be of high significance, the overall impact on avifauna is considered to be moderate negative significance (this includes destruction and alteration of habitat, displacement of birds from the site, disturbance of breeding and mortality from turbines). A worst-case scenario has been taken into account to reach this finding and there is a requirement for a budget to be put aside for any potential mitigation during operation ensuring affective mitigation can be undertaken if required. Given both of these facts it is concluded that the impact can be properly mitigated if required and will be less than predicted. In the Kouga area a unique situation exists where an entity already exists for the purpose of strategically managing biodiversity conservation, the Greater Kromme Stewardship Initiative. It was therefore recommended that the Impofu Wind Farms should become a fully paid up member of this association during construction and operation for the purpose of further research and mitigation into such issues as the impacts of wind farms on priority bird species in the Kouga area.

Similarly, the impact of terrestrial habitat loss and impact on broad-scale ecological processes was also rated moderate but mitigation includes the avoidance of specific habitats (dunes and wetlands) and minimisation of the development footprint areas, as well as contribution to the Greater Kromme Stewardship Initiative. This impact can therefore be reduced to a residual minor negative significance.

The negative impact on bat mortalities from moving turbine blades has been assessed as high moderate significance which can be reduced to low moderate with mitigation. Site specific mitigation for the project applies (i.e. initial curtailment, followed by adaptive management / mitigation based on the operational data). It remains the responsibility of each wind farm to lower their estimator fatalities below the acceptable sustainability thresholds when bat fatalities are unsustainably high, which will lower the overall cumulative impact of all wind farms in the area.

The only other moderate impact was that of the visual impact of the turbines. No mitigation exists as No-Go areas have already been avoided during screening and viewsheds would tend to overlap to some degree, particularly as the proposed Impofu West Wind Farm can be seen as an infill wind farm in relation to the surrounding existing wind farms.

Although cumulative aquatic impacts are rated as negligible negative significance, these can result in impacts of minor positive significance with proposed rehabilitation of wetlands. It was proposed by the specialist that mitigation includes the development and implementation of wetland and watercourse rehabilitation plan post environmental authorisation, i.e. once the final number of turbines and roads layouts has been finalised. This would reduce, and possibly improve the state of the affected aquatic environment at any of the proposed crossings, especially those shared with wind farms within the region.

Another key mitigation measure to ensure no significant negative impacts to archaeological material specifically is that of monitoring during construction. The impact on shadow flicker is rated as being of minor negative significance even with a worst-case scenario being applied in the assessment. It is therefore proposed that actual shadow flicker measurements are undertaken once the wind farm is operational to identify actual exceedances which should be less than anticipated and proposed suitable mitigation will be applied only where required.

Positive impacts include the financial security offered to farmers from the development of wind farms in the area and the additional income they are earning, which is rated as being of moderate significance. Socio-economic impact benefits include the stimulation of local and national economy, job creation, increase in household earnings, and increase in government revenue. Archaeological recording is also a positive impact of the project, as it provides an opportunity to record such material discovered in the area that might have been lost otherwise.

Other than the potential high impact of bird mortality from the turbines which is based on a worst-case scenario that can be confirmed during operational monitoring, there are no other major negative impacts which will exceed a critical threshold through the development of the project. All efforts to mitigate any residual project specific impacts should be pursued and contribution to the Greater Kromme Stewardship Initiative should be considered to contribute to local bioregional conservation efforts.

No other high or major impacts, or any which will exceed a critical threshold, are expected from the development of the project. However, all efforts to mitigate project specific impacts should be pursued and contribution to the Greater Kromme Stewardship Initiative should be considered to contribute to local bioregional conservation efforts.

8 Conclusions and way forward

The proposed Impofu West Wind Farm project offers the potential to contribute to South Africa's national commitment to transition to a low carbon economy, but this needs to be weighed up against potential negative and other potential positive impacts such a development may have. As such a detailed Screening and Iterative Design, Scoping and EIA process has been undertaken for the project to date. This has resulted in the determination of what is believed to be the best practical environmental option possible for the Impofu West Wind Farm site, comprising 29 potential turbine locations.

The Impofu West Wind Farm is one of three proposed wind farms to be developed on a consolidated site near Oyster Bay in the Eastern Cape. It is located in an agricultural area that is transitioning to a renewable energy landscape due the presence of the existing and planned renewable energy projects in the broader area.

8.1 Summary of the project

The project is described in detail in Section 5. Table 8.1 summarises the development components and their specifications.

Table 8.1: Summary of technical details for the proposed Impofu West Wind Farm

Component	Description / Dimensions
Location of the site	The project is located approximately 24 km south-west of Humansdorp, and 14 km north-west of Oyster Bay, in the Sarah Baartman District Municipality in the Eastern Cape as taken from the centre point of the site. The project site area falls within the jurisdiction of the Kouga Local Municipality. The site is bordered immediately to the west by the existing Tsitsikamma Community Wind Farm.
Facility area	The site is ± 2,640 ha in extent.
SG codes	The wind farm site comprises of 8 farm properties. Refer to Table 5.1.
Site access	The site will be accessed from the DR01765, the MN50032, DR01774 and DR01764. Existing roads will be utilised and upgraded as far as possible.
Export capacity	Up to 174 MW (up to 6 MW per turbine x 29 turbines). Note that future DOE REI4P bidding rounds may allow wind farms greater than 140 MW and also DEA approved turbine locations may have to be dropped due to other permitting or technical issues in the process of obtaining a fully permitted wind farm.
Proposed technology	Wind Energy – onshore horizontal access turbines.
Hub height from ground level	Hub height from 90 m to 120 m, rotor diameter up to 150 m (75 m blade / radius) therefore the maximum tip height will reach up to 195 m. A minimum ground clearance (i.e. lower tip height) of 30 m has been applied.[15].
Rotor diameter	Maximum of 150 m
Area occupied by substations *(including operation and maintenance buildings and areas)*	Impofu West substation approximately 150 x 75 = 11,250m^2
Area occupied by both permanent and construction laydown areas	Total approximately 204,500 m^2 comprising of: Temporary construction laydown areas (turbine hardstand areas): 29 x 100 x 50 m = 145,000 m^2; Temporary site camp areas: 15,000 m^2 and batching plant area of approximately 1000 m^2;

[15] Note that this is considered to represent an exacerbated rotor swept area envelope and the actual turbine used will have a fixed hub height and rotor diameter within these constraints.

Component	Description / Dimensions
	Permanent laydown areas of approximately 29 x 50 x 30 m = 43,500 m^2
Area occupied by buildings	See area occupied by substations above.
Width and length of internal roads	Internal road network is ±24 km in length, here existing roads and tracks will be used as far as practicable. Permanent roads will be approximately 6 m wide. Some sections of these roads would need to be temporarily widened up to 12 m during construction.
Length of overhead lines	Approximately 950 m of internal overhead lines (four locations).
Proximity to grid connection	A new Eskom line from Port Elizabeth forms part of a separate application which includes the line, a collector substation, collector line and switching station on the site; this connects directly with the proposed Impofu West substation on the site.
Type and height of fencing	Any existing fences that are disturbed will be repaired or replaced with something similar to the original. Temporary fencing may be erected around the construction site offices and laydown areas, for security, health and safety reasons. Permanent security fencing will be installed around the substation area to prevent unauthorised access. Fencing may be up to ±3 m in height.

8.2 Summary of the process

Table 8.2 provides a summary of the key dates of the EIA process for the project to date.

Table 8.2: Summary of key activities undertaken during the Scoping and EIA process for the project

Task	Description and date
Pre-application meeting	A pre-application meeting was held with DEA on 17 October 2017 and 11 September 2018
Screening and Iterative Design PPP	• A Pre-Application meeting was held on 17 October 2017 with the competent authority, DEA, to ensure that an appropriate EIA process would be followed. • Advertisements in Afrikaans, English and isiXhosa were placed in the provincial newspaper, Eastern Cape Herald newspaper, on 14 December 2017 and placed in the local newspaper, Kouga Express, on 21 December 2017 notifying the broader public of the initiation of the EA processes and inviting them to register as I&APs. • Trilingual site notices (Afrikaans, English and isiXhosa) erected at various public entrances and public libraries, in December 2017. • Background Information Document (BID) was compiled to provide a high-level introduction to the project. This was distributed to landowners, identified key stakeholders as well as any registered I&APs from December 2017 - February 2018. • Three focus group meetings were held in PE and St Francis Bay between 6-8 February 2018 with local authorities, landowners and adjacent landowners (of the wind farms) and key identified stakeholders such as conservation bodies and local community groups.
Specialist studies and preparation of the Draft Scoping Report	April – July 2018
Pre-Application PPP	• Pre-Application Scoping Report made available for a five-week public comment period: 1 August - 7 September 2018 • Three public meetings/open days held at the St Francis Bay Bowling Club (21 August 2018), Thornhill Hotel (22 August) and Innibos Lapa in Despatch (23 August).

Task	Description and date
	• Notification of the public comment period and public meetings sent in writing (via post) to all registered I&APs by 25 July 2018, or via email by 31 July 2018 • Trilingual advertisements of the public comment period and invitation to attend the public meetings was published in the Eastern Cape Herald (30 July 2018) and the Kouga Express (26 July 2018). • Existing site notices were updated to indicate the start of the pre-application public comment period and announce the details of the public meetings. • Hard copies of the Pre-Application Scoping Report were deposited at: Kouga Municipality (St Francis Bay), Oyster Inn/ Oyster Bay Estate Agent*; Humansdorp Library, Thornhill Hotel and Alan Ridge Library (in Uitenhage). • Electronic copies of the report made available on Dropbox, Aurecon's PPP website, and via CD on request.
Updating of specialist studies and Final Scoping Report	September - October 2018
Scoping PPP	• Draft Scoping Report made available for a 30-day public comment period: 11 October - 9 November 2018. This was extended to 12 November 2018 due to a minor delay in delivery, with some I&APs only receiving notification on 11 October 2018. • Notification of the public comment period sent in writing to all registered I&APs on 4 October 2018 by post, and 10 October 2018 via email. • Hard copies of the Draft Scoping Report deposited at: Kouga Municipality (St Francis Bay), Oyster Inn, Humansdorp Library, and Thornhill Hotel. A hard copy of the report was also made available to the Organs of State on request. • Electronic copies of the report made available on Dropbox, Aurecon's PPP website, and via CD on request.
Comment on Draft Scoping Report	• DEA acknowledgement of receipt of the application and Draft Scoping Report: 12 October 2018 • DEA submitted comments on the Draft Scoping Report: 7 November 2018
Acceptance of Final Scoping Report	• DEA acknowledgement receipt of the Final Scoping Report: 26 November 2018 • DEA accepted Final Scoping Report: 25 January 2019
Application for extension of timeframes	• Extension letter received by DEA: 29 January 2019 • Extension granted by DEA: 3 March 2019
Specialist impact assessment studies and preparation of the Draft EIR	February – March 2019
EIR PPP	18 April 2019 – 23 May 2019
Comment and Decision on Final EIR	In terms of Regulation 24 of GN R982, DEA must within 107 days of receipt of the EIR and Environmental Management Programme (EMPr), in writing- (a) Grant environmental authorisation in respect of all or part of the activity applied for; or (b) Refuse environmental authorisation.

8.3 Summary of impacts

The potential impacts expected to arise from the proposed wind farm and associated infrastructure are summarised below in Table 8.2. Should the mitigation provided in the tables in Section 6 and detailed in the EMPr (Appendix F) be implemented, post-mitigation impact ratings are assessed as ranging from negligible, minor and moderate negative significance with one impact of major-moderate significance (visual intrusion); with fewer positive impacts, mostly socio-economic, but these are in the range of minor to moderate significance.

Table 8.3: Summary of potential impacts

Environmental aspect	Impact	Pre-mitigation	Post-mitigation
Construction			
Terrestrial ecology	Loss of vegetation and plant SCC	Moderate (-)	Minor (-)
	Direct and indirect impacts on fauna	Minor (-)	Minor (-)
Aquatic ecology	Loss of aquatic species of special concern	Minor (-)	Negligible (-)
	Loss of remaining wetlands with high sensitivity	Minor (-)	Negligible (-)
	Loss of riparian systems and watercourses	Minor (-)	Negligible (-)
	Impact on localised water quality	Minor (-)	Negligible (-)
Bats	Destruction of foraging habitat by clearing vegetation	Negligible (-)	Negligible (-)
Avifauna	Destruction of bird habitat	Moderate (-)	*Low to Moderate (-)
	Disturbance of birds	Negligible (-)	Negligible (-)
Agriculture	Loss of agricultural land use	Minor (-)	Minor (-)
	Discontinuation of farming activities	Negligible (-)	N/A
	Interference with farming operations	Negligible (-)	Negligible (-)
	Degradation to natural agricultural resource base	Negligible (-)	Negligible (-)
	Depletion of potential agricultural water resources	Negligible (-)	N/A
	Increased financial security for farmers	Moderate (+)	N/A
	Improvements to shared infrastructure	Minor (+)	Minor (+)
	Improved farm security	Negligible (+)	N/A
Socio-economic	Temporary stimulation of the national and local economy	Moderate (+)	Moderate (+)
	Temporary increase of new employment opportunities in the national and local economies	Moderate (+)	Moderate (+)
	Contribution to skills development in the country and local economy	Minor (+)	Moderate (+)
	Temporary increase in household earnings	Minor (+)	Minor (+)
	Temporary increase in government revenue	Minor (+)	Minor (+)
	Impact on property and land value in the immediately affected area	Negligible (+)	Negligible (+)
	Changes to the sense of place[16]	Minor (-)	Minor (-)
	Temporary increase in social disruptions associated with the influx of people	Minor (-)	Negligible (-)
	Impact on economic and social infrastructure	Minor (-)	Negligible (-)
Archaeology	Impacts on pre-colonial landscape along 5 km wide coastal strip	Moderate (-)	Negligible (-)
	Impact on surrounds of quarry with in situ ESA and MSA stone artefacts	Major (-)	Negligible (-)
Noise	Construction noise	Minor (-)	Minor (-)

[16] Note that sense of place was assessed by both the social specialist and visual specialist, the pre-mitigation impact rating of the visual specialist was higher, however both ratings have the same residual impact with mitigation.

Environmental aspect	Impact	Pre-mitigation	Post-mitigation
Visual	Visual intrusion on the rural landscape and scenic resources[16]	Moderate (-)	Minor (-)
Traffic	Deterioration of road condition due to increased traffic volumes	Minor (-)	Minor (+)
	Incidents due to increased traffic volumes	Minor (-)	Negligible (-)
	Delivery of concrete	Moderate (-)	Minor (-)
Operation			
Terrestrial Ecology	Impacts on fauna	Moderate (-)	Minor (-)
	Impacts on CBAs	Moderate (-)	Minor (+)
Aquatic ecology	Impact on aquatic systems through increase in surface water runoff	Minor (-)	Negligible (-)
Bats	Bat mortalities due to moving turbine blades	Moderate (-)	Minor (-)
	Bat mortalities due to light attraction	Moderate (-)	Negligible (-)
Avifauna	Disturbance of birds	Minor (-)	Minor (-)
	Displacement of birds	Negligible (-)	Negligible (-)
	Bird fatality through collision with turbine blades	Moderate (-)	Moderate (-)
	Bird collision and electrocution on overhead power lines	Minor (-)	Negligible (-)
Agriculture	Loss of agricultural land use	Minor (-)	Minor (-)
	Discontinuation of farming activities	Negligible (-)	N/A
	Interference with farming operations	Negligible (-)	Negligible (-)
	Degradation to natural agricultural resource base	Negligible (-)	Negligible (-)
	Depletion of potential agricultural water resources	Negligible (-)	N/A
	Increased financial security for farmers	Moderate (+)	N/A
	Improvements to shared infrastructure	Minor (+)	Minor (+)
	Improved farm security	Negligible (+)	N/A
Socio-economic	Sustainable increase in production and GDP nationally and locally	Moderate (+)	Moderate (+)
	Creation of sustainable employment positions nationally and locally	Moderate (+)	Moderate (+)
	Skills development of permanently employed workers	Moderate (+)	Moderate (+)
	Improved standard of living for benefiting households	Minor (+)	Minor (+)
	Sustainable increase in national and local government revenue	Moderate (+)	Moderate (+)
	Provision of electricity for future development	Moderate (+)	Moderate (+)
	Local economic and social development benefits derived from operations	Moderate (+)	Moderate (+)
	Improvement of the livelihoods of the households dependant on the local agricultural sector	Moderate (+)	Moderate (+)

Environmental aspect	Impact	Pre-mitigation	Post-mitigation
	Negative changes to the sense of place[17]	Negligible (-)	Negligible (-)
Noise	Operational noise	Negligible (-)	Negligible (-)
Shadow flicker	Shadow flicker	Minor (-)	Negligible (-)
Visual	Visual intrusion of the wind turbines on the rural landscape, settlements, scenic resources and overall sense of place[17]	*Major – moderate (-)	Major moderate (-)
	Visual intrusion of related infrastructure on the rural farming landscape	Moderate (-)	Minor (-)
	Visual intrusion of lights at night on dark skies	Moderate (-)	Moderate (-)
	Visual intrusion of remaining structures and access roads on the rural landscape	Moderate (-)	Minor (-)
Traffic	Deterioration of road condition due to increased traffic volumes	Minor (-)	Minor (+)
	Incidents due to increased traffic volumes	Minor (-)	Negligible (-)
Decommissioning			
Terrestrial ecology	Alien plant invasion following decommissioning	Minor (-)	Minor (-)
	Faunal impacts due to decommissioning.	Minor (-)	Minor (-)
Aquatic ecology	Loss of aquatic species of special concern	Minor (-)	Negligible (-)
	Loss of riparian systems and watercourses	Minor (-)	Negligible (-)
	Impact on localised water quality	Minor (-)	Negligible (-)
Avifauna	Disturbance of birds	Negligible (-)	Negligible (-)
Agriculture	Loss of agricultural land use	Minor (-)	Minor (-)
	Discontinuation of farming activities	Negligible (-)	N/A
	Interference with farming operations	Negligible (-)	Negligible (-)
	Degradation to natural agricultural resource base	Negligible (-)	Negligible (-)
	Depletion of potential agricultural water resources	Negligible (-)	N/A
	Increased financial security for farmers	Moderate (+)	N/A
	Improvements to shared infrastructure	Minor (+)	Minor (+)
	Improved farm security	Negligible (+)	N/A
Socio-economic	Temporary stimulation of the national and local economy	Moderate (+)	Moderate (+)
	Temporary increase of new employment opportunities in the national and local economies	Moderate (+)	Moderate (+)
	Temporary increase in household earnings	Minor (+)	Minor (+)
	Temporary increase in government revenue	Minor (+)	Minor (+)
	Changes to the sense of place[18]	Minor (-)	Minor (-)
	Temporary increase in social disruptions associated with the influx of people	Minor (-)	Negligible (-)

[17] Note that 'sense of place' was assessed by both the social specialist and visual specialist, the impact rating of the visual specialist was higher and therefore is taken to be the presiding rating for this impact.
[18] Note that sense of place was assessed by both the social specialist and visual specialist, the pre-mitigation impact rating of the visual specialist was higher, however both ratings have the same residual impact with mitigation.

Environmental aspect	Impact	Pre-mitigation	Post-mitigation
	Impact on economic and social infrastructure	Minor (-)	Negligible (-)
Noise	Decommissioning noise	Minor (-)	Minor (-)
Visual	Visual intrusion of remaining infrastructure on the rural landscape[18]	Moderate (-)	Minor (-)

8.4 No-Go alternative

The No-Go alternative assumes that the project is not developed and the activity does not go ahead. This alternative provides the baseline scenario against which the preferred alternative, as the basis of this report, can be compared. The No-Go alternative was assessed by each specialist as detailed in the respective studies summarised in Section 6.

Most specialists have assessed the No-Go as being neutral as no changes to the *status quo* will occur. However, a few specialists have considered the No-Go alternative to be undesirable as it would assume that there was a continuation of current negative environmental impacts occurring in the study area. These specialists include terrestrial ecology, aquatic ecology and avifauna. The negative trends observed are primarily related to intensification of agricultural land uses (e.g. clearing of land for pivots or being converted to grazing, water abstraction and agricultural return flows into watercourses affecting water quality etc). In response to this the terrestrial ecologist identified the project as an opportunity to work with the Greater Kromme Stewardship Initiative on a sustainable basis to identify critical areas that can be targeted for conservation.

The archaeologist also identified that the no-go scenario would result in continued negative impacts of low or unknown significance on archaeological resources due to natural processes as well as agricultural activities. Since the development is considered to have an overall low impact from an archaeological standpoint, this reflects no difference as to whether the project proceeds or not.

In terms of socio-economic impacts, if the project was not developed, the potential macro-economic benefits as well as job opportunities, and associated improvement in livelihoods, that could be created are forgone. Similarly there would be no contribution to a more sustainable national energy supply. The traffic specialist also maintains that the current condition of the road and lack of road maintenance due to budgetary constraints within various spheres of government would persist and the community would be worse off given that if the project was developed, it has been recommended that the developer contributes to maintenance of the roads used during the various phases of the development thereby having a positive impact for the community.

In summary, the project has a number of potential negative environmental and social impacts which would not be experienced if the project did not go ahead. However, the benefits of the project would be foregone and the opportunity to contribute to South Africa's national commitment to transition to a low carbon economy and to provide socio-economic, community and biodiversity benefits would not be achieved in this instance. Negative impacts of the No-Go alternative could include further environmental degradation from agricultural activities and deteriorating road conditions. As a whole, these negative impacts are however lower than the overall negative impacts should the project go ahead.

8.5 Cumulative impacts

The impacts of the proposed project in combination with the other Impofu Wind Farm projects, and past, present and future wind farm proposals in the study area have been assessed for each specialist discipline. These were Scenario 1, the three Impofu Wind Farms, and Scenario 2, the three Impofu Wind Farms plus identified other proposed wind farms with environmental authorisation. All operational wind farms were already accounted for as the baseline environment.

The cumulative impacts depend largely on application of the project specific mitigation identified in Section 6. Many of the impacts were rated as negligible or minor negative significance, however there were a few negative moderate impacts of concern and one high residual impact that could be mitigated.

No other high or major impacts, or any which will exceed a critical threshold, are expected through the development of the project

8.6 Level of confidence in the assessment

Assessment of potential environmental impacts requires prediction of the impacts of a defined activity against the collected baseline data, through application of professional judgement. It therefore depends on the level of information available describing the activity; the quality of the baseline data collected; and the skills and expertise of the specialists involved. The specialists listed in Table 2.3 were all selected based on their experience of similar projects and /or their experience in the area and local knowledge, this included access to information on the actual construction and operational impacts from some of the existing wind farms.

Each specialist study included a review of detailed aerial photography and site visits to the area to ensure representation of the seasons where necessary, as well as micro-siting of turbine locations, monitoring of the baseline (bats, birds and terrestrial ecology), focus groups and consultation with landowners (agriculture and socio-economic) and consultation with relevant authorities. The EAP's expertise has been listed in Table 2.2, refer to Appendix A for the full CVs and a signed declaration. Furthermore, the EAP was supported by a team of environmental practitioners that also have experience in renewable energy as well as having knowledge of the area.

A comprehensive screening process that was adopted at the earliest stage of the project has allowed for a robust screening of the consolidated Impofu Wind Farm site, so that the preferred approach to mitigation, being avoidance, could be implemented. This allowed for identification of the 'best practical environmental option' for the site layout design of all three Impofu Wind Farm projects to be taken into the subsequent Scoping and EIA Phases. The site layout has further been informed by the findings of 12 months of bird and bat monitoring. The total number of turbines for all three wind farms was reduced from 208 to 95 turbines and the overall site layout was reduced from 15,427 ha to 11,838 ha. This is testament to the ongoing screening and refining to avoid all areas of high environmental sensitivity.

The level of information provided regarding the activity throughout the lifecycle of the project is considered to be adequate. The level of project information was comprehensive as Red Cap has been involved in developing the adjacent Gibson Bay Wind Farm and Kouga Wind Farms, and were able to provide an in depth knowledge of the practicalities and technicalities during construction and operation of a similar facility in the same context.

To make up for the uncertainty regarding the specific wind turbine technology that would be installed (described in Section 5) a worst-case scenario was adopted as a precautionary measure in the form of an exacerbated rotor swept area envelope. Specialists have therefore assessed a combination of specifications that represent the worst case (and which would never in reality be developed).

On this basis, the confidence in the environmental assessment undertaken is regarded as being acceptable for decision-making, specifically in terms of the environmental impacts and risks. The EAP believes that the information contained within the EIR is adequate to support DEA in determining the environmental acceptability of the proposed project.

8.7 Recommendations and opinions of the EAP

The mitigation measures proposed by the EAP and relevant specialists (Section 6; and Appendix E) are recommended to manage the identified impacts associated with the proposed project and associated infrastructure. These have been translated into practical measures included in the EMPr (Appendix F). Specific measures that should be included as conditions for environmental authorisation are those which would have a material influence on the sustainability of the project, refer to Table 8.4 below:

Table 8.4: Proposed conditions of authorisation

No	Discipline	Details of condition
1.	Terrestrial ecology	1.1. Appoint a specialist to conduct a pre-construction walkdown of the development footprint to further refine the layout and reduce impacts through micro-siting of the turbines and access roads. 1.2. Appoint a specialist to conduct a 'Search and rescue' for reptiles and other vulnerable species prior to construction before areas of intact vegetation are cleared. 1.3. Contribute to the development to the Greater Kromme Stewardship Initiative.
2.	Aquatic ecology	2.1. Appoint a specialist to conduct a pre-construction walkdown as part of a Plant Search and Rescue plan, with the appropriate permits in place. 2.2. Appoint a specialist to conduct a post-authorisation site walkdown to assist in developing a stormwater management plan, and wetland rehabilitation and monitoring plan.
3.	Bats	3.1. Appoint a specialist to undertake operational bat monitoring. 3.2. Implement the operational mitigation action plan as advised by the specialist (as attached to the Bat Specialist Report).
4.	Avifauna	4.1. Appoint a specialist to conduct a pre-construction walkdown to confirm final turbine layout and identify any sensitivities that may arise between the environmental authorisation and the construction phase. 4.2. Appoint a specialist to implement the 'during construction' and 'post-construction' bird monitoring programme (outlined in Appendix 4 of the Bird Specialist report) and according to the latest available version of the best practice guidelines at the time. 4.3. Appoint a specialist to monitor the breeding status of Martial Eagles in all breeding seasons post acceptance of the project as preferred bidder (to establish baseline) and including during and post construction. 4.4. Provision for a mitigation contingency budget to address potential impacts detected during operation through monitoring.
5.	Agriculture	5.1. Install cattle grids (to the specifications supplied in the Agricultural Specialist Report) where necessary in consultation with landowners to mitigate the risk of gates being left open.
6.	Socio-economic	6.1. No specific conditions as socio-economic considerations are a requirement of REI4P.
7.	Archaeology and Palaeontology	7.1. Appoint a specialist to conduct archaeological monitoring during the construction phase. 7.2. Appoint a specialist to conduct a walkthrough of the potential overhead 33 kV transmission line routes to ensure any unforeseen impacts are mitigated.
8.	Noise and shadow flicker	8.1. Specialist to measure actual shadow-flicker impact at the identified sensitive receptors. If exceedances are determined, identify and install the most suitable screening for the receptor.
9.	Visual	9.1. No specific requirements as mitigation for the primary impact does not exist.
10.	Traffic	10.1. Specialist to compile a Transport Management Plan (TMP) (post EIA but before construction commences when all relevant information is thus available) to be implemented at the construction and operational phases of the development. 10.2. Developer contribute to the maintenance of the road network, to the order of R 2 million during the construction period and R 1 million per year during operational phase, commencing the year after successfully achieving Commercial Operation.
11.	Wake effect	11.1. No specific requirements.

In summary, this EIR includes an assessment of the positive and negative environmental, social and economic impacts of the preferred layout for the proposed project as identified in the 10 specialist studies. The primary focus of the environmental assessment process was to avoid environmentally and socially sensitive areas in the site layout design to reduce residual impacts as far as possible. This allowed the best practical environmental option for the site to be identified, as well as for Impofu Wind Farm consolidated site as a whole. The site is characterised by excellent wind conditions and low levels of turbulence, making it one of the best wind resources in the country and ideal for wind farm development, hence the site is located amongst operational wind farms. The presence of operational wind farms in the area has been an integral consideration of the assessment as it informs the baseline environment. Furthermore it is acknowledged that the project cannot be assessed in isolation from other proposed projects, both the other two Impofu Wind Farms as well as identified authorised future wind farms in the area; as additional impacts to receptors in the study area can be expected.

The EIR documents a number of residual negative impacts ranging from negligible, minor and moderate negative significance with one impact of major-moderate significance (visual intrusion); with fewer positive impacts, mostly socio-economic, but these are in the range of minor to moderate to major significance.

The negative construction impacts are mostly from direct land take for the footprint of the facility, or a related to disruption arising from construction activities. The highest of these residual impacts was the loss of avifauna habitat which was rated as low to moderate negative significance with mitigation. The other moderate impacts could all be mitigated to minor or negligible significance through a number of preventative actions (to protect archaeology resources), walkthroughs to avoid impacts (terrestrial ecology) and a traffic management plan (to plan towards the delivery of concrete). Positive construction impacts largely relate to socio-economic impacts from the stimulation of the local economy through spend, employment and skills development, with other indirect benefits. These positive socio-economic residual impacts range from moderate to minor significance.

The operation of the wind farm has a unique set of impacts, the most notable being mortality of bats and birds as well as the visual impact. The impact on bats from moving turbine blades as well as light attraction is rated as moderate negative significance but can be mitigated to minor and negligible negative significance respectively through the application of mitigation. This is primarily the implementation of operational monitoring and then adaptive management if unacceptable losses become evident. The impact of bird fatalities from collisions with turbine blades however remains as moderate negative significance even after mitigation has been applied. It has been recommended that a monitoring programme be implemented; since it is not possible to determine what mitigation may be appropriate in the future, provision for a mitigation contingency budget for operations is recommended. The negative impacts on fauna and CBAs both rated as moderate negative significance can be mitigated to minor negative and minor positive respectively through design measures and also contribution to the Greater Kromme Stewardship Initiative to assist with land management and biodiversity conservation within the area. The visual intrusion of the wind turbines on the rural landscape, settlements, scenic resources and overall sense of place is assessed as being of major to moderate negative significance and cannot be mitigated but is partly offset by existing wind farms in the landscape. The other infrastructure can all be mitigated to minor negative significance except for visual intrusion of lights at night which remains as moderate even after recommended design measures have been adopted.

Positive impacts that are felt over various phases of the development in relation to agriculture is the additional income for farmers from the operation of the wind farms, the improvements to shared infrastructure and improved farm security. Most notable is the increased financial security that has been demonstrated through by landowners already benefiting from the other existing wind farms in the area, rated as moderate positive significance. This presides over the impacts of minor or negligible significance from loss of productive land or interference on operations, and indirectly through impacts to natural resources on which farmers rely.

Other positive socio-economic impacts of the operation of the project include a wide range of impacts rated as major positive significance, at both local and national levels. This includes sustainable increase in production and GDP, employment, skills development, increase in government revenue, provision of electricity for future development, local economic and social development benefits, as well as improvements of livelihoods for the local agricultural sector. The contribution from the developer towards maintenance of the local road network is also thought to have a positive impact for society.

Decommissioning has also been included in the assessment. As a worst case it has been rated the same as construction, however, all impacts are likely to be notably lower as some components will be left *in situ*, and intensive activities like concrete batching and dispatching will not be necessary. All residual negative impacts are rated as negligible or minor negative significance. The most notable negative impact which can be mitigated from moderate to minor negative significance is the visual intrusion of remaining infrastructure. Positive impacts are expected mainly from the stimulation of the economy and creation of jobs with associated indirect impacts.

With regards to the cumulative impacts of the project it is opinion of the EAP that since there are no high or major impacts that can't be suitably mitigated, that no critical threshold will be exceeded through the development of the project. The No-go alternative does present negative impacts of lower significance but is also a lost opportunity for socio-economic benefits and sustainable energy production. After consideration of all identified impacts, including the compliance with the principles of NEMA that advocate for sustainability and the potential for the wind farm to contribute to South Africa's national commitment to transition to a low carbon economy, the EAP is of the opinion that the proposed project based on the preferred layout alternative is acceptable, and no fatal flaws have been identified.

8.8 Way forward

This EIR will be updated where necessary following 30 days of public review. The Public Participation Report (Appendix C) will be updated and included in the Final EIR. The Final EIR will be submitted to the DEA for review and decision-making (for 107 days) whereby an environmental authorisation would be granted or refused. All registered I&APs will be notified of the outcome.

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