ENVIRONMENTAL IMPACT ASSESSMENT FOR THE DIAZ WIND PARK AT LÜDERITZ

FINAL 2018 UPDATE – VERSION 4

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EXECUTIVE SUMMARY

Introduction

A full-fledged Environmental Impact Assessment (EIA) was performed for the Diaz Wind Park site in 2001, but the project was not implemented.

In 2007 Aeolus Power Generation Namibia received a License to generate wind energy in Namibia. During 2010/11 the current project proponent under the name of Diaz Wind Power (PTY) LTD, which consists of United Africa Group (Namibia), Sojitz Corporation (Japan), and Korea Midland Power Co., Ltd. (South Korea) joined to continue with the development of the project.

This document serves as the fourth amendment to the EA Report that was completed in August 2001.

The current EIA differs in essence from any of the previous versions due to significant changes in the nature of the project and size of the project area (See Terms of Reference Section).

Enviro Dynamics was appointed to up-date the original EA with the change in the project scope, the technology that will be used by DIAZ, and to confirm certain assumptions on which the original EA had been based.

The final report reflects the cumulative work done on the EIA up to the current version. The following work has been added under the current scope of works of, since October 2011:

- New Vegetation Specialist Study.
- New Archaeology Specialist Study.
- New Visual Assessment Study.
- New Public Consultation Process.
- New Project Description.
- New Impact Assessment Chapter.
- The remainder of the document was reviewed and updated where necessary to contain to date information.

A third update increased the amount of wind turbines considered to 26;

A fourth update was conducted to comply with:

- The latest turbine data; the number of turbines was amended to a maximum of 16 positions, from which 11 will be developed in the first phase of the project (larger turbine MW capacity, therefore fewer needed, minimising site impact).
- Lender and IFC standards.

Public Consultation

Public participation approaches used for the 2001 EIA on the project were consistent with the NEAP.

Due to the change in ownership and scope of the project the proponent is required under the Environmental Management Act (2007) to conduct a new round of public consultation with stakeholders and the public.

The authority focal meetings and the public consultation meeting were held during the week of 15 September in Windhoek and Lüderitz. The public also were informed through advertisements to respond.

The result was that further additional studies were commissioned to investigate the influence on birds and Brown Hyena.

Legal Environment

The legal section discusses the various energy related instruments that guide the generation and distribution of electricity.

Furthermore the project environment is regulated by a wide set of legal instruments due to its unique context. This includes diamond area regulations as well as the Tsau//Khaeb (Sperrgebiet) National Park Management Plan.

In addition the IFC standards and Equator Principles for the environment were reviewed and applied to the project.

Project Description

The project will be the first utility-scale wind power project in Namibia, helping to diversify the country's power supply away from 1) aging and polluting fossil-fuel power stations, and 2) expensive and insecure power import contracts (which also typically rely on fossil fuel generation).

The project is located in the Lüderitz Peninsula, to the immediate south east of the town of Lüderitz.

The design principles and layout of the wind park to be able to accommodate up to 26 Wind Turbine Generators (WTG) is discussed, it being noted that Diaz does not intend to install more than 11 turbines for the first 44MW of contracted power supply. Diaz Wind Power was issued a 44MW electricity generation licence by the Electricity Control Board, and signed a Power Purchase Agreement (PPA) with NamPower in December 2017 for the sale of this power.

Each WTG is approximately 150m high and requires road and electrical cable infrastructure as well as a central sub-station to function.

In total a cumulative area of about 10ha will be used at the project site.

The Affected Environment

The project area, which is in the Lüderitz Peninsula required a special investigations in terms of:

- Vegetation Specialist Study.
- Archaeology Specialist Study.
- Visual Specialist Study.
- Birds Specialist Study
- Brown Hyena Specialist Study
- Aviation Safety Study

The site showed significant sensitivities in terms of vegetation (Lüderitz Peninsula dwarf-shrubland), marine bird flight paths, and Brown Hyena residence towards the western section of the site. The central section of the site is also potentially sensitive in terms of vegetation (Lüderitz Plain dwarf-shrubland). The eastern section of the site, where most of the turbines will be located, is the least sensitive area.

The archaeology of the site could be avoided and protected.

Impact Assessment

The accumulation of impacts from the project specifically centres around the impacts expected on birds, the Brown Hyena, and vegetation in the Lüderitz Peninsula Scrubland zone.

It is clear from the sensitivity maps of these aspects that the entire site shows various levels of sensitivity. However the cumulative effects are clearly concentrating in the north-western extension of the project site.

The only means by which the cumulative impacts can be managed is by avoidance, which is addressed by the wind park design, locating the turbines in the less sensitive areas.

The sensitivity of the entire site necessitates direct intervention in the control of access of the site for the various activities that will take place during planning, construction, and operations.

The access management intervention can be classified as follows:

Table i: Environmental Management Intervention Zones

Access Zone	Environmental Management Intervention
Zone 1	**No-go Zone:** The area is not accessible for any personnel or outsides under any circumstance. No roads and activities are allowed in this zone. No WGTs will be allowed in Zone 1.
Zone 2	**Vegetation Protection Zone:** Very limited access is allowed only for authorized personnel and no access for outsiders. Access will be authorized by request only on a daily basis, under the control of the Site Environment Officer. This zone may only accommodate minimum new roads, internal power lines and demarcated WTG work space. Clearing of any vegetation will only be allowed during construction under the control of the Vegetation Management Plan.
Zone 3	Limited Access Zone: Free access is allowed to all personnel only on existing roads and demarcated WTG work space. This zone may accommodate support infrastructure such as the substation, and office/storage facility. Clearing of any vegetation will only be allowed during construction under the control of the Vegetation Management Plan.

Map 9 in the Report shows the position of each Environmental Management Intervention Zone. The use of Zone 1 is not allowed and of Zone 2 is minimised. Zone 3 is less sensitive, and is where most of the turbines will be located.

The position in a National Park, sensitivity of the site and the required management system for both the Vegetation Management Plan and the Environmental Management Intervention Zones necessitates that the client appoint a person on site that will fulfil the role of ***Site Environment Officer*** either on a permanent basis of as a function to one of the site personnel. This is included in the client's EMP and staffing plan/budget.

Recommendations

The North Western section of the project area is of particular conservation importance and should not be considered for any form of development.

The reasons for these are:

- It's allocation as a conservation area in the Tsau//Khaeb (Sperrgebiet) National Park management plan.
- The occurrence of significant Brown Hyena activity.
- The recognised avian flight corridor of local and regional significance.
- The very limited Lüderitz Peninsula Scrubland occurring in this section of the site.

The cumulative impacts described in the North Western section cannot be justified in terms of the benefits of the project and, seen in the light that this area was not part of the original project, should be considered as a no-go area. Neither is off-set in terms of the above mentioned sensitivities appropriate or practical.

There is however also enough justification if a wind park is developed in the original site. The project will be the first full-scale renewable energy project in Namibia, except for hydropower.

With careful consideration and planning of environmental management principles the development proposed can be optimised to become a sustainable project.

In order to assure that the project is sustainable and environmentally beneficial the following requirements will have to be satisfied:

- Adhering to the existing conservation framework.
- Implementation and monitoring of the entire Environmental Management Plan

In order to be able to adhere to the above mentioned requirements the following capacity and system must be put into place:

- Appoint a Site Environment Officer to coordinate and monitor the adherence to the Tsau//Khaeb (Sperrgebiet) National Park Management Plan and the Environmental Management Plan, as well as the external environmental audit process.
- Establish a working group with the relevant stakeholders in the Ministry of Environment and Tourism which will actively review and approve project activities in terms of adherence of the Tsau//Khaeb (Sperrgebiet) National Park Management Plan and the Environmental Management Plan, as well as the external environmental audits.
- Implement an external environmental audit system on a quarterly basis during construction and on an annual basis during the operation of the Wind Park. This must be used to verify the effectiveness of the EMP and implement adjustments if required.

It is hereby recommended that the project ***be approved for Environmental Clearance*** subject to the following conditions:

- The recommendations are incorporated in the Environmental Management Plan.
- The project proponent sign an Environmental Contract based on the recommendations and the Environmental Management Plan with the Ministry of Environment and Tourism.
- The regular external environmental audits be submitted to the Ministry of Environment and Tourism for continued endorsement of the Environmental Clearance.

NOTE TO READER:

During the EIA process the client was made aware that the north-western section of the site is very sensitive with potential cumulative impact that must be considered as a No-Go Zone (see Chapter 12 and Map 9). The client adjusted the WTG layout to avoid this No-Go Zone.

Therefore all maps in the EIA and EMP Reports shows the final layout after adjustment, which significantly mitigate the potential disturbance caused by the project through avoidance of the most sensitive areas.

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Therefore all maps in the EIA and EMP Reports shows the final layout after adjustment.

History of the project

Namibia is presently supplying its electrical energy needs from energy sources at Ruacana (Hydro – 240MW), Windhoek (Van Eck - coal-thermal – 120MW), Walvis Bay (Paratus – diesel – 24MW) and Eskom/SAPP imports. The development of the Kudu Gas Project is delayed indefinitely. For a large part of the year most of Namibia's electricity needs are met through imports from the Eskom Grid or elsewhere within the SAPP at considerable expense. Apart from the renewable energy from Ruacana Hydro Power Station, all the other sources of electricity, including the Eskom imports, are generated at thermal facilities that contribute largely to the greenhouse effect of global warming through the emission of gasses i.e. CO_2 and NO_x.

In pursuit of the global trend towards the supply of "clean" energy, NamPower, in conjunction with The Ministry of Mines and Energy (MME), was considering construction of a pilot Wind Park in the vicinity of Lüderitz. The aim of the developers was to ascertain the technical, economic, and environmental viability of erecting and operating Wind Parks in Namibia. The idea was if the project were to proceed, in the pilot phase the Wind Park was expected to produce 3 to 10 megawatts (MW) and, if successful, would be expanded to 20MW. The expressed purpose of the Wind Park was for research into the viability thereof in Namibia and to keep abreast of new technological advances and the operating and maintenance (O&M) of Wind Parks.

Consequently a Feasibility Study was conducted to identify an ideal location for a Wind Park in Namibia by Deutsche Energie-Consult Ingenieursgesellschaft (DECON). As part of the site-selection process, a preliminary EIA was conducted with specific consideration of proximity to human settlements and avian patterns, migrations and habitat. Only sites that were pre-determined to have acceptable levels of environmental impact were chosen for further study.

The study indicated that all the elements for successful and sustainable production of electricity from wind are in place and that the Lüderitz area is the most promising in terms of site characteristics and economic viability. After careful consideration and investigation of obvious environmental impacts of four possible sites, it was decided that the current project location was the most acceptable site and it has the highest production capacity, thus providing maximum potential benefit. A full-fledged Environmental Impact Assessment (EIA) was performed for the site in 2001.

In 2007 Aeolus Power Generation Namibia received a License to generate wind energy in Namibia.

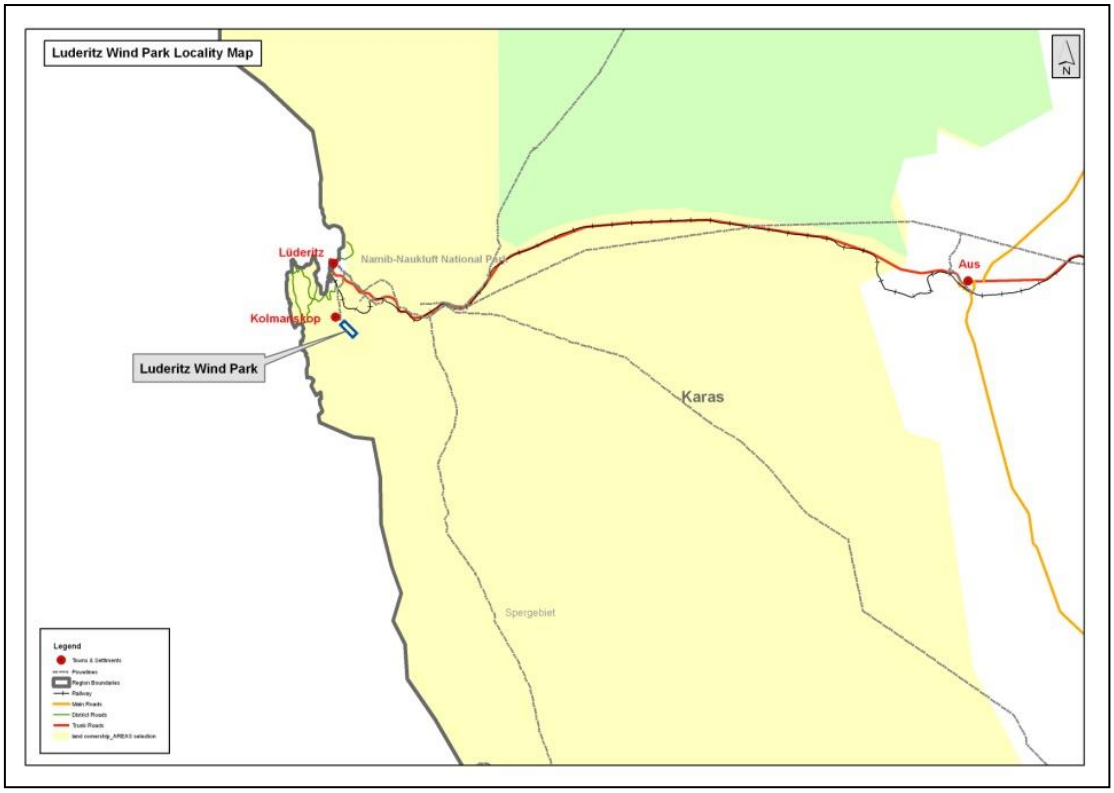
The Tsau//Khaeb (Sperrgebiet) National Park was proclaimed in 2008, after the project was launched.

During 2010/11 the current project proponent under the name of Diaz Wind Power (PTY) LTD, which consists of United Africa Group (Namibia), Sojitz Corporation (Japan), and Korea Midland Power Co., Ltd. (South Korea) joined to continue with the development of the project.

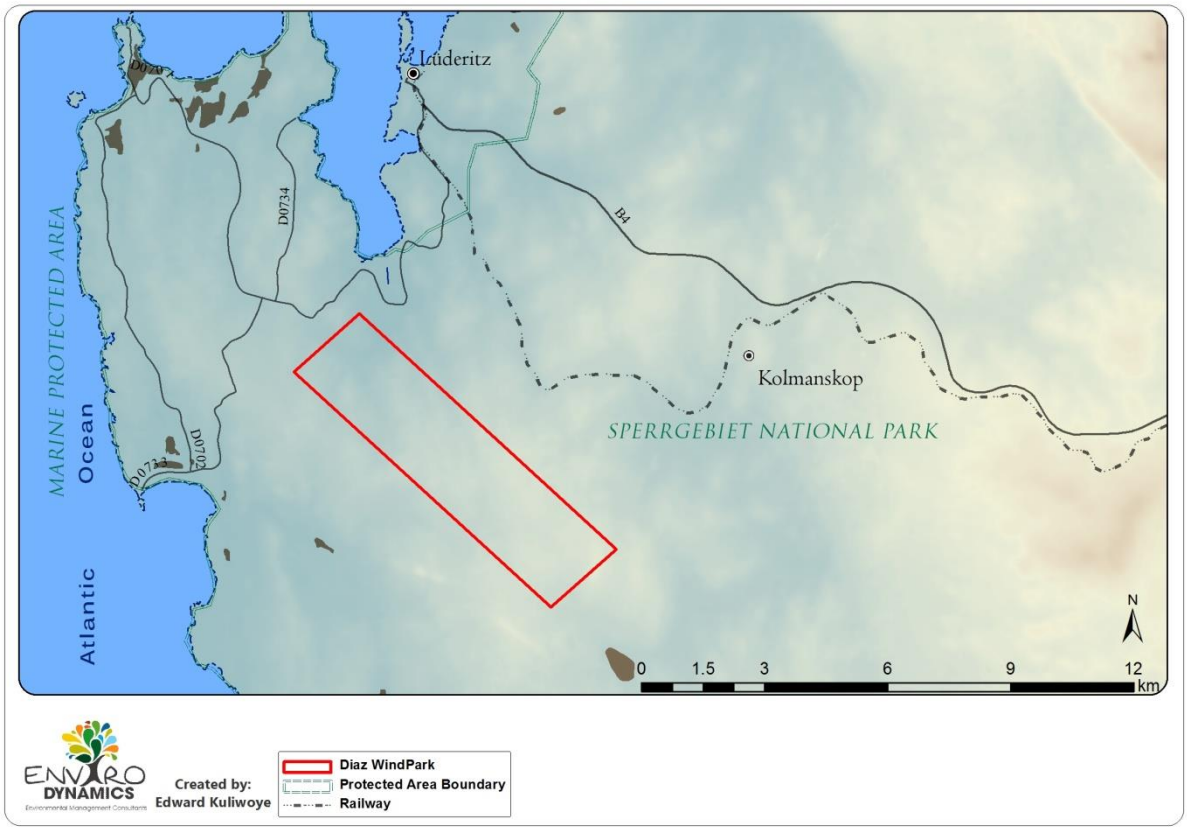
Sojitz Corporation and Korea Midland Power Co. subsequently exited the project for internal reasons, and were replaced by Quantum Power, which entered the project in 2011, as the co-sponsor for Diaz alongside United Africa Group.

This document serves as the fourth amendment to the EA Report. The third amendment was completed and received Environmental clearance on 11 February 2015.

The current EIA differ in essence from any of the previous versions due to significant changes in the nature of the project and size of the project area (See Terms of Reference Section).



Map 1 Locality of Lüderitz Wind Park



Map 2 Project Area

2 Terms of Reference

Before proceeding to project implementation, Government policy requires that an Environmental Assessment be done to ensure that the above mentioned development would have the least possible negative effects to the environment. Therefore Terms of Reference (ToR) were developed by NamPower which called for an Environmental Impact Assessment (EIA) to be conducted, consistent with the Ministry of Environment and Tourism's Namibian Environmental Assessment Policy (NEAP). As per the NEAP, NamPower's ToR called for an EIA to be conducted for power generation facilities greater than 1MW and transmission lines in excess of 30 kV rms.

NamPower awarded the tender to conduct the EA to Interconsult Namibia, (PTY) Ltd. Interconsult (ICN) at the time was an earth sciences company specialising in environmental analysis and review, geology, soils, and natural resources management. ICN subcontracted Chris Hines at the time to conduct the flora and fauna investigation; Mr Hines was also the leading authority on local ornithology, which is of high significance to Wind Park development. SIAPAC was subcontracted to carry out the Social Impact Assessment and Public Participation aspects of the investigation and Dr. Mary Seely to conduct an internal review of the Final Report. The original Environmental Assessment (EA) Report was submitted in August 2001.

Since then Aeolus Power Generation Namibia received a License to generate wind energy in Namibia and they will develop the Wind Park. The current project proponent under the name of Diaz Wind Power (PTY) LTD consist of United Africa Group (Namibia), Sojitz Corporation (Japan), and Korea Midland Power Co., Ltd. (South Korea).

Enviro Dynamics was subsequently appointed 2011 to up-date the original EA with the change in the project scope, the technology that will be used by DIAZ and confirm certain assumptions on which the original EA had been based.

- Upgrade the EIA study assumptions and limitations.
- Revise and upgrade the Admistrative, Legal and Policy requirements to international standards. This will in particular focus on the International Conventions section to be in line with IFC and TBL practices. This will include the Civil Aviation safety Report.
- Change the Project Description to suit the new project scope in terms of the new site size, layout and the technical specifications of the project. This will include revised maps.
- Prepare and conduct a second round of public consultation and add a Chapter on the public consultation process.
- Incorporate the new project scope and the new design into the Assessment of the Disturbance within the Study Area.
- Revise the Affected Environment in terms of:
    - Topography
    - Hydrology
    - Provide a detailed specialist study on the site flora and incorporate in the EIA Report.
    - Fauna, in particular birds along the western extension of the site (This was extended to a full bird specialist study and limited Brown Hyena review after the public consultation process).
    - Provide a detailed specialist study on the site archaeology and incorporate in the EIA Report.

  - Revise the visual impacts due to extension of the site boundaries. The original visual impact parameters changed significantly and it is suspected that the visual impact from the Kolmanskop historical site has not been assessed.
  - Review the social impact section.
  - Review the Legislative environment section.
  - Add a map that will visually present the sensitivities of the site as a tool for developing the site with least impacts realized.
- Review the project alternatives chapter and add a "No Project Alternative" section.
- Add an Impact Assessment section to the Evaluation.
- Review and revise the Recommendation chapter.

Finally Enviro Dynamics revised and upgraded the existing Environmental Management Plan to suit the EIA recommendations and include applicable IFC and TBL Performance Standards, including the following aspects:

- Closure and decommissioning
- Labour and Working Conditions
- Pollution Prevention and Abatement
- Community Health, Safety and Security
- Biodiversity conservation and Sustainable Natural Resource Management, depending on the outcome of the final site visit of the infrastructure routes.
- Cultural Heritage depending on the findings of the archaeological study.
- Any other issues that may be raised by the IAPs during the next round of Public Participation.

The original EA was revised, expanded, and upgraded to meet the standards of the International Finance Corporation (IFC) and the relevant Namibian Legislation such as the EMA (2007). Enviro Dynamics also undertook to compile an Environmental and Social Management Plan for the Construction and Operational Phases.

Third update

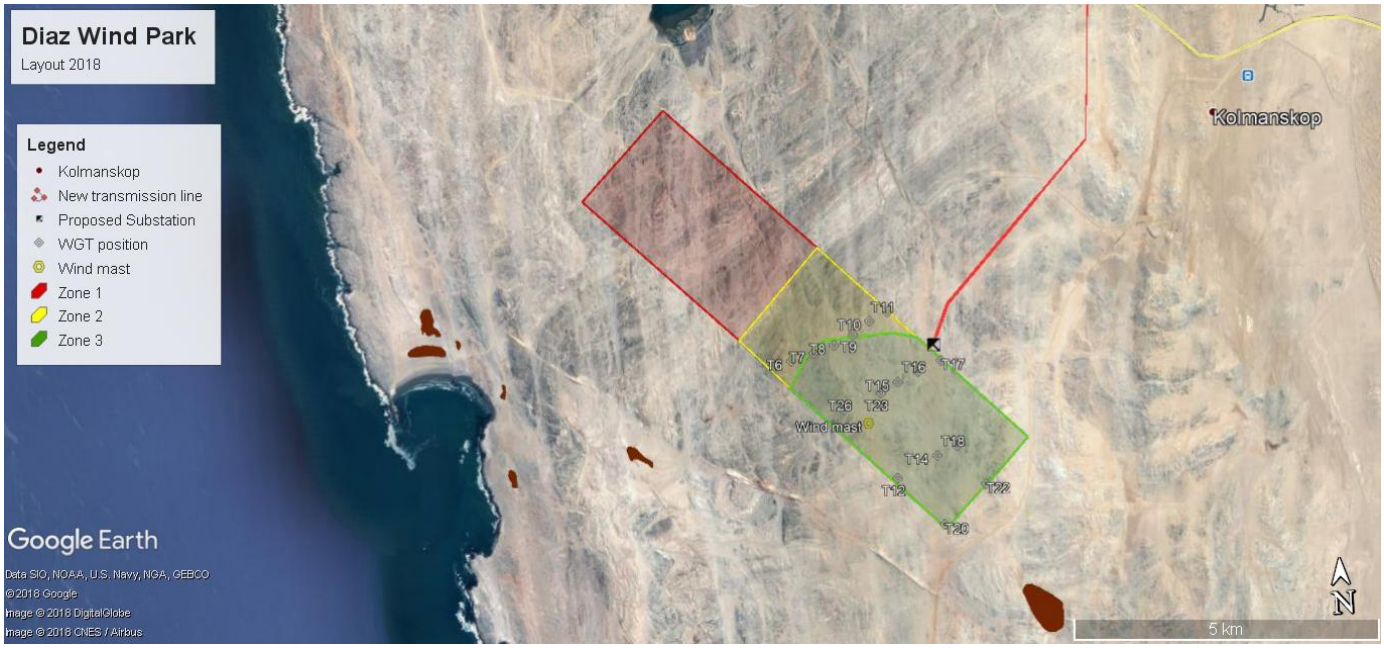
The third update was completed in 2013 by Enviro Dynamics to include four additional wind turbine (Map 3).

Fourth update

The fourth update is the current update.

This entails adding and clarifying information based on

- Revision of the wind turbines to 16 sites of which a potential 11will be developed.
- post-2013 Park Management Plans, IFC Guidelines and comments on the EIA/EMP compliance with IFC standards by Environmental Management Resources (dated 9 November 2016).
- It includes a Critical Habitat Study, based on the Vegetation Study.
- Input from the Ministry of Environment and Tourism, following a detailed site visit, regarding conservations measures to be taken by Diaz.



Map 3 Amendment 04: Positions of revised wind turbines to only be located in the least sensitive zones within the site, in accordance with the recommendations of this EIA.

3 Approach to Study

Introduction

While the approach to conduct this EIA follows the NEAP guidelines and requirements, some deviation and expansion of the policy was required due to the unique nature of the proposal. This EIA is unusual for three reasons:

1. The project is costly and pro-environment (a "green" project) that is beneficial to the global community at Namibia's expense; the environmental benefits of the project will be realised in the South African environment through reduced emissions of coal fired electricity and, consequently, marginally reduced acid rain potential. Ethically this is irrelevant, but cross boarder conditions are not specified in the NEAP while emphasising positive benefits is.
2. The study area is a unique environment due to strict regulation by Government and Industry. Thus, legal restrictions, rather than the project *per se*, may create environmental hazards such as restrictions on removal of toxic service fluids from the area.
3. The proposed project is new to Namibia and, for the most part, to Southern Africa. While there are a number of international case studies on the impacts of Wind Parks, they need to be interpreted for the unique African physical environment and social conditions.

Thus, some additional sections were adapted for review based on international issues raised over Wind Parks. Recommendations in The Sperrgebiet by Pallet, et al, 1995 were also added as this book represents the most comprehensive environmental study on the region to date.

The final report reflects the cumulative work done on the EIA up to the current version. The following work was added under the scope of works of October 2011:

- New Vegetation Specialist Study.
- New Archaeology Specialist Study.
- New Visual Assessment Study.
- New Public Consultation Process.
- New Project Description.
- New Impact Assessment Chapter.

The 2018 update includes:

- New wind turbine layout of 16 potential turbine sites (see Map 3).
- IFC Guidelines for Wind Energy dated August 2015 (World Bank Group, 2015).
- A Critical Habitat Study based on the existing Vegetation Study.
- Input from the Ministry of Environment and Tourism, following a detailed site visit, regarding conservations measures to be taken by Diaz.

The remainder of the document was reviewed and updated where necessary to contain to date information.

Literature review of the affected environment

A review of relevant literature and project documents was undertaken prior to commencement of fieldwork. As the area has been (and remains) closed to the general public, little research has been done on the biological environment of the potential impact site. Most available information was in the form of general texts relevant to the Namib Desert and to a lesser extent to the Sperrgebiet itself. Due to mining and exploration interests in the area, a significantly higher amount of information is available on geology and soils. Data on the social environment were available for the Region as a whole, and to a considerably lesser extent the immediate Project area (e.g., Lüderitz).

Literature review of international Wind Park issues

While Wind Parks are new to Africa, they have been in large-scale use for commercial energy production throughout the rest of the world for over 30 years. The Internet was used extensively for this aspect of the research, as relevant publications are not readily available in Namibia. Since this report was first drafted, numerous wind power projects have been developed across Africa, primarily in South Africa.

Wind Parks have been a controversial form of commercial energy production since their introduction. Consequently, there are a great deal of contradictory findings and reports by credible organisations and institutes. This stage of research focused specifically on identified shortcomings, problems and issues of Wind Parks reported by action groups and other organisations that are opposed to Wind Parks or wind energy. Specific concerns and topics were repeatedly brought up and formed the primary focus of the study team before commencement of field studies.

Additional literature review conducted in 2007 consisted of the International Finance Corporation's Performance Standards on Social and Environmental Sustainability as well as the IFC's Environmental, Health and Safety Guidelines specifically for Wind Energy. These were verified during the 2011 update. The 2018 update includes the IFC Guidelines for Wind Energy dated August 2015 (World Bank Group, 2015).

Remote Sensing

Stemming from the literature study, a large amount of environmental data is available for the study area. These data, like the literature, were used to provide a background of information that was later verified during field investigation.

Field investigations

Fieldwork in the area commenced on 2/11/2000 and finalised on the 12/12/2000. Sixty-two hours were spent on the site during this time, with the majority of the time being spent in the area defined by the proposed WEC placements. The major focus of fieldwork was the evaluation of the major habitats at the site and to assess these in terms of the flora and fauna. Emphasis was placed on the potential impact of the Wind Park on the avifauna of the area as this was identified as an elevated concern in the Feasibility Study (DECON, 1999).

Soil and geology field analyses was limited in that after several weeks of preparation, permits could still not be arranged in time for the collection and removal of samples. However, due to the homogeneity of the geology, available research for the region, and that this EIA is a general overview rather than a site-specific study, this was not a setback. On-site review of the terrain and topography was also necessary to revise concerns regarding surface and sub-surface hydrology.

Discussions were held with biologists, land managers, NamPower personnel, NamDeb security officers and other relevant individuals as to the potential impacts of the Wind Park at the proposed site. A list of people with whom discussions were held is given under Sections 14 & 15.

During the latter part of 2010 and the start of 2011 additional site investigations were conducted in the fields of vegetation and archaeology.

A further longitudinal bird impact study will be conducted during 2018 to comply with IFC and South African guidelines.

A biodiversity workshop was conducted with the Ministry of Environment and Tourism, and representatives from the National Parks authority in March 2018, accompanied by independent biodiversity advisors.

Public Consultation

The change of ownership and scope of the project a new round of public consultation has been conducted during August to September 2011. This was done to communicate the changes to the project and understand any additional issues that may require investigation.

4 Assumptions and Limitations

The assumptions and limitations mentioned in the EA Report of 2001 are not applicable any more, since project design has started and the necessary information is available.

The following solutions exist for the assumptions previously made:

- The project design and construction plans are discussed in Section 6 of this Report.
- The size and type of facilities to be used and net electrical generation are also discussed in Section 6.
- The co-ordinates of the Wind Park as well as a site layout are available (see Map 1).

Limitations identified for the 2007/11 update:

- A 132 kV transmission line will transfer electricity from the Wind Park to a NamPower Substation some 25 km away through the desert. The power line is not specifically addressed in this EA update. A separate specific EIA was conducted for the transmission line.
- The access road to the Wind Park will turn off from the private Namdeb Elizabeth Bay mine road, but the co-ordinates of the road to be constructed are not available yet. The access road is thus not specifically addressed in this EA update, however it is not expected to have a material disturbance since existing mine access roads will be used, with only a short spur off to the wind park site.
- The EIA is now only for the current site as extended with the coordinates and number of turbines as provided in Section 6 of the report.
- The EIA Report takes precedence over the Appendixes attached to the report.

5 Public consultation

Activities up to 2007

Public participation approaches used for the 2001 EIA on the project were consistent with the NEAP. Activities included the following:

- Adverts and Information Pieces

  Public notices and press release in some newspapers (e.g., The Namibian and Die Republikein).

- Stakeholder List

  Letters were sent out to all stakeholders in Windhoek, Lüderitz, -Keetmanshoop and Oranjemund.

- Stakeholder Information Release - Background Document, Draft Report to be provided to the public after Client review.

- Start-up Public Meetings in Windhoek and Lüderitz

  Notification of the public meetings was advertised in The Namibian and in Die Republikein. Notices were also posted to all stakeholders in Windhoek and Lüderitz and Keetmanshoop and Oranjemund. The councillor of Lüderitz constituency also assisted by directly notifying potential participants. The public meetings took place in Windhoek and Lüderitz on 9 and 10 November 2000, respectively. A total of 54 people attended the meeting, excluding the presenters and meeting organisers.

- Closing Public Meetings in Lüderitz and Windhoek.

- Open Door Policy

  Contact details of team personnel were given in writing and at the start-up workshops. People were invited to contact any of the relevant personnel with observations and/or questions.

- Additional Public Participation in 2007

  The Ministry of Environment and Tourism (MET), Directorate of Environmental Affairs (DEA) was consulted again in 2007 to confirm that the amended EA will meet their requirements for the go-ahead of the Project development. According to the DEA the update of the EA also involves Public Participation in which Interested and Affected Parties (I&AP's) are notified that the Project is going ahead and final details provided. Further input from them should be considered and included in the EA (*pers. comm. Saima Angula, DEA EIA Department*).

  Another round of Public Participation will consequently be undertaken whereby an updated Background Information Document (BID) will be circulated to all stakeholders that were identified in 2001 and any additional parties since then. Response from this circular will indicate whether another round of public participation meetings in Windhoek and Lüderitz is required and this arranged if necessary.

- Procedural check with the Local Authority

  The Karas Regional Council was contacted to determine appropriate procedures for the Project. Mr Jacobs of the Council stated that a Project presentation to the Regional Council is required. This presentation can either be combined with their monthly Regional Council meeting in Keetmanshoop

or a special meeting can be arranged. The Regional Council will hold a scheduled meeting towards the end of November 2007. After the presentation the Regional Council will discuss the Project and provide comments to the Client after an agreed period. Meetings with the Local Authority can follow at a later stage or be combined with further Public Participation Meetings. (*pers. comm. Mr. Jacobs, Regional Officer, Karas Regional Council*)

Public Consultation activities during 2011

Due to the change in ownership and scope of the project the proponent is required under the Environmental Management Act (2007) to conduct a new round of public consultation with stakeholders and the public.

A new Background Information Document was developed to assist the stakeholders in understanding the project scope (see Appendix B).

The public consultation process was published in the National Newspapers during the period of 25 August to 14 September 2011. A stakeholders list was developed including all relevant local, regional, and national authorities as well as individuals that responded on the newspaper advertisements and that attended the meetings.

Focal Meetings were held with the following authorities:

- Ministry of Mines and Energy.
- The Electricity Control Board.
- Representatives of the Ministry of Environment and Tourism, Directorate of Parks and Wildlife, as well as the Succulent Karoo Ecosystem Planning group (SKEP).
- Authorities Meeting in Lüderitz which included representatives of the Lüderitz Town Council, the Karas Regional Council, as well as the local representatives of the Ministry of Environment and Tourism.

The various focal meetings were attended by 21 officials.

The public meeting was held on 15 September in Lüderitz. It was attended by 12 people, excluding the consultant and client representatives. The minutes of the meeting are available in Appendix C.

All stakeholders were given the opportunity to comment both on meetings and electronic media, or in writing during the comments period of 25 August to 23 September 2011. Most comments were solicited on the meetings, but some key comments were received via e-mail.

From the minutes of the meetings and other comments the Issues and Responses Trail was developed (Appendix C). The following key issues were raised:

- The movement of birds and bird conflict with the project.
- Physical and electro-magnetic interference with the airport.
- Future closure and rehabilitation assurance.
- The EIA for the transmission line may fail.
- The effect of electricity tariffs.
- Improve the communication with the community.
- Provide work and business opportunities to the local community.
- Increase in the size of the site.
- The site is not in the Tsau//Khaeb (Sperrgebiet) National Park.

- The movement and conflict with Brown Heyna.
- Disturbance of the sensitive Succulent Karoo vegetation.
- The content of the original EIA is dated and incomplete.

These issues will be considered and addresses in the impact assessment if they are relevant according to the revised baseline.

Public Consultation activities during 2012

The final Public Comments Period took place for two weeks from 15 June 2012 to 29 June 2012. Only one response was received and incorporated (see Appendix C).

6 Administrative, legal and policy requirements

An important component of an EIA is the review of applicable and relevant legislation thereby informing the client of the legal requirements to be fulfilled in constructing the proposed Wind Park.

This section is intended to review all applicable legislation. There are some items reviewed here which need not be strictly complied with in building the proposed Wind Park, power line and access roads, but which are mentioned for the purpose of the client conforming and, generally, for the sake of completeness. Applicability and implications of the legislation that is reviewed here is discussed more in the body of the report where issues arise.

Legislation of Pre-emptory Importance

The Electricity Act 2 of 2007

The Electricity Act was signed into effect on 26 September 2007 and establishes the Electricity Control Board to regulate in the case of this project the:

a) "provision" of electricity in Namibia and the efficiency thereof.

b) Assurance of competitiveness in the industry and to promote private investment in the industry.

The Electricity Control Board (ECB) must as part of its duties make recommendations to the Minister with regard to:

a) the issue, transfer, amendment, renewal, suspension and cancellation of licences;

b) the approval of the conditions on which electricity may be provided by a licensee;

c) codes, rules and guidelines for the industry to function within.

The ECB charges a levy on all electricity provided as a source for its funding.

It is therefore clear that the client would have to obtain permission from the board in order to operate, distribute and market any electricity generated from the project. There is a positive duty imposed on the client in terms of Section 17(1) for the client to obtain a license involving:

a) the generation of electricity;

b) the transmission of electricity;

c) the supply of electricity;

d) the distribution of electricity;

e) the importation of electricity; or

f) the export of electricity

It should be further noted that each of these activities listed above requires a separate permit in terms of Section 17(2).

In terms of Section 20 (1), should the client require the obtaining of a license, an application must:

d) be submitted to the board; and

e) be advertised at the expense of the applicant, in the prescribed manner.

The board must then consider an application in terms of section 18(1) and if an objection is received, has the discretion to arrange for a public hearing at a suitable time and place. Notice of 14 days must be given to the applicant and every objector. Legal practitioners may represent either the applicant or the objector and evidence may be led by the parties to the hearing either in support of or against the granting of the license. Not more than 30 days after the hearing, the board is to submit its findings to the Minister of Mines and Energy together with its recommendations for the issuing or rejection of a license.

The said Minister then has the discretion to grant or refuse to grant an application for a license. If the application is refused however, the applicant is entitled to written reasons from the Minister for the refusal. If the application is granted by the Minister however, the Board must issue the license in such form as the Board determined. Furthermore, the license must:

a) specify the particular activity authorised by the license;

b) define the area in respect of which the license is issued;

c) contain or have attached to it any conditions imposed in relation to the license, in addition to those provided for in the Act; and

d) contain a schedule specifying the approved tariffs that may be charged by the licensee for the supply, provision or distribution of electricity to different classes of consumers.

Section 21 prescribes that the Minister or the Board in considering an application for the issuing, renewal, amendment or transfer of a license to give due consideration to matters or activities which may adversely affect, or result in damage to, the environment or the rights of others, weighed against the advantages in general that would be derived from such application. The Minister or Board is further empowered to:

a) request from the applicant an environmental impact assessment study indicating the potential damage to or pollution of the environment and any steps taken by the applicant to minimise such damage generally and in terms of existing legislation;

b) request the applicant to submit details of the technical and economic-financial resources available to the applicant to execute the work, to operate the system and to carry on the business to which the application or license relates, substantiated by documentary proof where applicable;

c) take into consideration the extent to which the activities of the applicant will or may be detrimental to or adversely affect the rights and operation of other licensees or their customers in their area of operation;

d) take into consideration the ability of the applicant to provide an effective service to customers;

e) take into consideration whether the granting or refusal of the application in question is in the public interest.

The client in this particular instance is further obliged in terms of Section 22 to obtain a preliminary license from the Minister to build and complete any structure which would be involved in the production of electricity, including the installation of plant and equipment.

The Minister would have to approve of the plan before issuing a preliminary licence in compliance with such conditions and requirements, and within such period as the Minister may determine. The Board must then write to the applicant informing it of the conditions and

requirements imposed by the Minister in granting a preliminary license. Even after having granted the preliminary, the Minister is still entitled to:

a) withdraw or amend any condition or requirement imposed by Section 20(1);

b) extend or further extend the period referred to in Section 20(1); or

c) approve an amended plan in respect of the premises.

If the board is satisfied that the requirements imposed by Section 22(1) and any additional requirements imposed by the Minister have been complied with, and the premises are suitable for the purpose for which they will be used under the license, the Board shall issue such license in terms of Section 22(4). The license is valid only for the period referred to on the license or any extension granted by the Minister in terms of Section 22(4).

According to Section 23, the license issued is valid for a period not exceeding 50 years unless cancelled sooner or the license is issued for a shorter period of time. Furthermore, a license may be renewed from time to time for such further period as the Minister may determine. The Minister in terms of Section 24 is further entitled to prescribe whatever additional conditions to the issuing, renewal, amendment or transfer of the license as he may deem fit.

Once a license is obtained by an applicant, it may not be transferred or ceded to any other person, unless the Minister, on recommendation of the Board has granted approval for such transfer in terms of Section 25.

Should the client wish to transfer such license, the application for transfer must:

a) be made by the licensee and proposed transferee jointly;

b) be submitted to the Board; and

c) be advertised at the expense of the applicants.

The Minister may either grant or reject any application to transfer a license although he is expected to give reasons for the refusal to grant the transfer of a license in terms of Section 25(8).

Even after a license has been issued, it may be amended by the Minister upon recommendation by the Board in terms of Section 26(1) of the Act. An application for amendment which does not involve more than a revision of the schedule of approved tariffs contained in the license may be considered and decided upon by the Board. The Minister still however retains authority to either grant or refuse to grant such amendment but is required to give reasons in terms of Section 26(8).

In terms of Section 27(1) of the Act, a license shall not levy any charge against any customer other than in accordance with the tariffs specified in the schedule of approved tariffs as listed in the license. The Board may from time to time upon application by a licensee, revise the schedule of approved tariffs of the license concerned, may require the licensee to submit such information as the board may require for that purpose. The Board in terms of Section 27(3), may in specific circumstances approve a deviation from a schedule of approved tariffs.

Section 28 of the Act places a positive duty on the holder of a license to supply electricity within its licensed area to every person who applies for the supply of electricity, and who is able to pay for such electricity, provided that the license holder has the capacity to do so.

Section 29 states that the Board is also given the authority to order a licensee to give up all or any part of such area to another licensee or prospective licensee as the Board may determine, subject to the payment of just compensation by the other or prospective licensee. In the same way the Board may via the minister assign the facilities to a new licencee if the existing licencee is refuced a renewal of its licence, on condition of an agreement being reached on compensation for the use of the facilities. The measures in Section 29 only applies if the licencee is not able to fullfill its obligations agreed to under the conditions of the licence

It is clear from the above that the mere obtaining of a license is does not entitle the client to carry out operations as it deems fit. It should be stressed to the client that both the Minister and Board have wide-ranging discretionary powers which are applicable even after a license

has been obtained. These discretionary powers could have a detrimental effect on the nature of the license even after it has been issued.

Diaz has, after due process, been issued with such licenses as required by the ECB. The ECB has conducted a thorough techno-commercial and legal analysis of the PPA and project characteristics, prior to signature of the PPA by NamPower and Diaz.

Another drawback to the holder of a license is contained in Section 30 of the Act which states that a licensee who is licensed to transmit electricity may not refuse another licensee the right of transmitting electricity through its electrical or transmission line (provided the other licensee is able to pay compensation approved by the board) unless such refusal is reasonably based on an insufficiency of technical capacity. This section could therefore oblige the client to make available its technical equipment to a local or external rival to the transmission of electricity. Since Diaz will hand over the constructed transmission line to NamPower at commencement of plant operations (COD), this is not an issue Diaz will face.

There is also a positive duty imposed on the holder of a license to continue supplying electricity to its clients. According to Section 31, a licensee may not reduce or discontinue the supply of electricity to a customer, except if the customer is:

a) declared insolvent;

b) has failed to pay any fees or charges due in accordance with the tariffs of the supply; or

c) has failed to comply with the conditions of supply.

The repercussions for non-compliance with any of the provisions of the Act are fairly severe. According to Section 32(1), if at any time it appears to the Board that a licensee has failed to comply with any of the requirements of this Act or meet any of the obligations in terms of the license, the Board, may require the licensee to default within a certain period. Furthermore, according to Section 32(2), if a licensee fails to comply with the requirements above, the Minister may withdraw or suspend and specify conditions to be met before the license is reinstated. The license holder is not exempt from either civil or criminal liability despite the sanctions imposed upon him by the Minister. Finally, the Board may recommend that a license be cancelled if, subsequent to the granting of a license, it is discovered that information furnished in connection with the application for a license was incorrect or incomplete in a material respect.

The client is also advised that any installations for the generation, transformation, transmission and distribution of electrical energy, including any alterations or extensions shall be built and operated with due compliance with the requirements of any other law. The client is further advised in terms of Section 34(1) of the Act, that should it intend to supply electricity to the Lüderitz area, the sale and supply of electricity within the area of jurisdiction of a Lüderitz local authority would have an impact on the project unless there is an agreement with the local authority stating otherwise. The Minister may however in terms of Section 34(2), instruct the Board to make arrangements or issue directives to the local authority for the promotion of the efficient utilisation of electricity. If possible, the client is urged to follow this approach as practically, it would enable the client to bypass the local authority by not having to obtain a license from it. Section 36 is also relevant to this matter.

The Cabinet in Section 35 may assist with the process of acquiring the land if the Licensee prove unable to acquire the land through normal channels

The client is advised that under Section 38 the licensee or any other person entitled to do so by the licensee, may at all reasonable times enter any premises to which electricity is or has been supplied by the licensee for the purpose of:

a) inspecting, testing, repairing or maintaining any line, meter, fitting or apparatus of the licensee which is on or in the premises;

b) ascertaining the quality of electricity consumed on the premises; or

c) removing any lines, meters, fittings or apparatus of the licensee if a supply to the premises is no longer required or if the licensee is entitled to cut off the supply.

The client is further advised that it is an offence in terms of the Act to:

a) carry on any undertaking in contravention of any of the provisions of the Act;

b) fail to carry out any order or decision of the Board or to comply with any condition imposed by the Board; or

c) as a licensee, to contravene or fail to comply with any condition applicable to the licensee in particular.

Conviction of an offence in terms of the Act subjects the offender to a fine not exceeding N$ 16,000-00 or a period of imprisonment not exceeding two years or both.

This Act repealed the Electric Power Proclamation of 1922 as well as the Electricity Act 2 of 2000 in its entirety.

The White Paper on Energy Policy

After perusing the Government's White Paper on Energy Policy and in particular, chapter 3,5 pertaining to renewable energy and chapter 4,2 pertaining to the environment, health and safety, no provisions that are legally peremptory or strictly contradictory to the building of the Wind Park, power line and access road were discovered. There is however, an acknowledgement of the possible contrast between the providing of environmentally sound but more expensive renewable energy as contrasted against providing the more conventional less expensive non-renewable energy. The policy paper appears to suggest that the advantages to be gained in the long-term use of renewable energy, such as sustainability outweigh the disadvantage of being more expensive than non-renewable energy. It should be noted that given the utility-scale of the Diaz project, it will deliver clean and affordable power, at a much lower per-kWh rate than NamPower is able to procure power from even fossil fuel alternatives currently.

The Atmospheric Pollution Prevention Ordinance 11 of 1976 (revised in 2006):

This Ordinance generally provides for the prevention of the pollution of the atmosphere and for matters thereto incidental. In terms of section 4 (1)(a) of the Ordinance the "Executive Committee" (whose position is now fulfilled by the Cabinet of the Government of the Republic of Namibia) may declare any area to be a controlled area for the purposes of the Ordinance. The entire country with the exception of the east Caprivi is currently a controlled area in terms of Government Notice 309/1976.

Part IV deals with dust control. The Ordinance is clear in requiring that any person carrying on an industrial process which is liable to cause a nuisance to persons residing in the vicinity or to cause dust pollution to the atmosphere shall take the prescribed steps or, where no steps have been prescribed, to adopt the best practicable means for preventing such dust from becoming so dispersed and causing such nuisance.

Only during construction is any dust pollution expected to be caused by the project, which will be mitigated as per the EMP by the EPC contractor.

Sperrgebiet Delimitation Proclamation 11 of 1920

The Sperrgebiet, originally referred to in the Ordinance of the German Imperial Colonial Office of the 22nd of September, 1908, was formally delineated in the Sperrgebiet Delimitation Proclamation 11 of 1920 (hereinafter "the Proclamation"). The Sperrgebiet area is a highly restricted area and is for obvious reasons a carefully guarded area. The Proclamation further provides for the geographical co-ordinates of the delineated area but fails to provide for any provisions regarding access.

The Proclamation is supplemented by Proclamation 35 of 1922 which merely serves to further define the precise delineated area. It should be noted that the Sperrgebiet area includes the portion of the strip of land 60 meters in width extending along, under and on either side of the

railway line from Lüderitz to Keetmanshoop between Kilometre 4 near Lüderitz and the point of intersection of the said railway line with the eastern boundary of the Sperrgebiet. This may need consideration for power line construction.

Access into the area for construction purposes anticipated by the client will require the obtaining of relevant permits from the NamDeb Diamond Corporation and possibly also from the Ministry of Mines and Energy, who may impose additional requirements and conditions before granting the client permits to investigate, construct and operate the site. The EPC contract will allocate responsibility for maintaining suitable permits.

Diamond Act 13 of 1999

(Repealing the Diamond Industry Protection Proclamation 18 of 1939 as amended by the Diamond Industry Protection Acts 15 of 1980 and 24 of 1982.)

Part V Permits

(27)(k);28;29

Any person will require a Permit to enter work or reside in a restricted area (such as the Sperrgebiet). The section under 28 prescribes the application conditions and the procedure for applying for and renewal of the necessary permit. Section 29 prescribes a fine of up to N$ 100,000 or 2 years imprisonment if contravened.

Part VI Control Measures in relation to unpolished diamonds.

(30-33); 52

No person may possess, sell, buy, receive, or deal with an unpolished diamond in his possession unless authorised as per the regulations of the law. The fine for the transgression is up to N$ 1,000,000 or 20 years imprisonment or both.

Restricted areas include all land that is

1. Registered under a mining licence, prospecting licence or deposit retention licence under the Minerals Act.
2. Any area declared as restricted as Gazetted by the Minister.

The Trespass Ordinance 3 of 1962

This Ordinance generally aims to prohibit the entry or presence upon land and entry of or presence in buildings in certain circumstances. The Ordinance simply requires that any person who enters or is upon any land or enters or is in any building or part of a building, shall be guilty of an offence unless he has a lawful reason to enter or be upon such land or be in or enter such building or any part thereof or unless he has the permission of the lawful occupier or owner or person in charge of any such land or buildings.

The Labour Act 7 of 2007

Each individual company, whether the client or a contractor of any kind, must adhere to the employment regulations of the Labour Act. Provisions of added importance bearing in mind the nature of the project are the following:

a) Section 32(3), which states that persons working overtime after hours or on Saturdays are to paid at a rate one and a half times their normal wages, whilst persons working on Sundays or on public holidays are entitled to remuneration calculated at twice their normal wage.

b) Section 38 pertaining to employees living on the place of employment or other premises of the employer. According to Section 38(1)(a), any employee required to live on the premises of the employer or elsewhere (such as a construction site) is to be provided with housing including sanitary and water facilities as may comply with the reasonable requirements of such employee.

The Labour Act also regulates all Heath and Safety aspects of the workplace. Sections 38 to 41 prescribe the duties of the employer and employee in the workplace as well as their responsibility to assure the safety of the general public. The rights of an employee to leave an unsafe place of work are also described.

Sections 42 to46 prescribe the obligation to have health and safety representatives and committees in every workplace. It also covers the requirements in terms of information and duties that must be shared in the workplace through these entities. The EPC contractor will be required to comply with all applicable laws, as per the EPC contract.

The Hazardous Substances Ordinance 14 of 1974:

This ordinance provides for the control of substances which may cause injury or ill-health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitising, or flammable nature or the generation of pressure thereby in certain circumstances.

The Ordinance divides substances or products into groups in relation to their degree of danger and furthermore provides for the prohibition and control of the importation, manufacture, sale, use, operation, application, modification, disposal or dumping of such substances and products. The Ordinance also provides for the control of certain electronic products. "*Electronic product*" is defined in the Ordinance as:

- any manufactured or assembled product which, when in operation
    - (i) contains or acts as part of an electric circuit; and
    - (ii) emits (or in the absence of effective shielding or other controls would emit) electronic product radiation; or
- any manufactured or assembled article which is intended for use as a component, part or accessory of a product described in paragraph (a) and which, when in operation, emits (or in the absence of effective shielding or other controls would emit) such radiation; "

"*Electronic product radiation*" is defined as:

- any ionising or non-ionising electromagnetic or particulate radiation; or
- any sonic, infrasonic or ultrasonic wave which is emitted from an electronic product as the result of operation of an electric circuit in such product."

The Ordinance, in essence, regulates the respective classes of hazardous materials. It would be superfluous to enter into a lengthy evaluation of the regulatory provisions of the Ordinance subject naturally to client being in a position to inform the consultant as to whether any product or substance encountered in this project falls within any of the respective groups of hazardous substances.

The Environmental Management Act No 7 of 2007

Namibia's Environmental Management Act was passed in Parliament in October 2007, and gives effect to Namibia's Environmental Assessment Policy (Government of Namibia, 2007). Essentially this Act specifies the environmental assessment procedures to be followed and the activities requiring EIA (provided in listed activities).

Of relevance to this Project are the following listed activities, provided in Section 27 of this Act, which include:

- water use and disposal;
- transportation;
- energy generation and distribution;

The regulations to the Environmental Management Act has been promulgated in 2012.

The 2012 Regulations sets out to:

- better inform decision makers and promote accountability of decisions taken;

- prescribe the need for environmental clearance for specific activities;
- strive for a high degree of public participation and involvement by all sectors of the Namibian community in the environmental assessment process;
- take into account the environmental costs and benefits of proposed policies, programmes and projects;
- take into account the secondary and cumulative environmental impacts of policies, programmes and projects; and
- promote sustainable development in Namibia, and especially ensure that a reasonable attempt is made to minimize anticipated negative impacts and maximize the benefits of all development.

The Heritage Act No 27of 2004

The Heritage Act of 2004 requires a developer to identify and assess any archaeological and historical sites of significance. The existence of any such sites should be reported to the Monuments Council and suitable protection or mitigation agreed on.

The Council may serve notice that prohibits any activities as prescribed within a specified distance of an identified heritage/archaeology site. It is an offence to use, handle, buy, sell or export an archaeological/heritage object or to survey for an object, alter land with archaeological/heritage object on it, endanger a archaeological/heritage site or access site with excavation equipment without a relevant permit.

This requirement is reflected in the EPC contract.

The Water Act 54 of 1956; Water Resources Management Act 24 of 2004

The Water Resources Management Act 24 is presently without regulations; therefore the Water Act 54 is still in force. The Act provides for the management and protection of surface and groundwater resources in terms of utilisation and pollution.

The Water Act is of application during the building of the power line, access road and the erecting of the Wind Park itself and pertains to the workmen, sub-contractors and employees on site. The relevance of the application of the Act in this instance is restricted to the conservation and use of water for *inter alia*, industrial purposes. Section 12(1)(a) of the Act requires the client before embarking on the building of the various projects to:

> "*advise the Ministry of the nature and the method of purification of the waste water, effluent or waste, if any, which will be occasioned by the operation of such undertaking*…"

The Ministry referred to is the Ministry of Agriculture, Water and Rural Development. Section 12(4) of the Act empowers the minister to decide:

> "(a) the quantity of water which is, in his opinion ordinarily available for use at the proposed source of supply;
>
> (b) whether or not the granting of a permit under this section would be likely to result in such a diminution of the supply as to endanger the reasonable supply of water from the same source to persons in the area of jurisdiction of the local authority, body or person concerned with the supply of such water, or (as the case may be) to persons entitled to use water from that source; and
>
> (c) whether it would not be desirable in the public interest or with a view to the decentralization of industrial undertakings or the nature of the waste water, effluent or waste which will be occasioned by the operation of the undertaking in question or the method to be applied in the purification of such waste water, effluent or waste, that such undertaking be established at a place other than at the place stated in the application.

The Act further empowers the Minister to grant a permit based on the application, to grant a modified permit or to refuse to grant a permit at all. This is clearly a vital section that must be complied with as the nature of the project could be significantly altered by the decision taken by the Minister in deciding whether or not to grant a water permit and if so, what permit to grant.

Furthermore, Section 21(1) of the Act requires that any wastewater, effluent or waste produced or resulting from the use of water for industrial purposes must be purified. Such purification must conform with the standard determined by the Minister after consultation with the South African Bureau of Standards. However, Section 21(3) exempts persons who obtain their water from the local authority, from having to comply with the provisions of section 21(3) if the local authority usually bears the responsibility of purifying water so provided. This means that the client is exempt from the provisions of section 21(3) if it obtains the water from the Lüderitz municipality.

Another ground on which the client may avoid having to comply with the purification requirements is for the client to apply directly to the Minister for an exemption in terms of Section 21(5) from Section 21(1). This is the recommended approach as reliance on the Lüderitz Municipality to purify the used water is not required (as stated by the provisions of section 21(3)). Non-compliance with section 21 of the Act is regarded as an offence in terms of section 21(8). This approach is also recommended above the drilling of a borehole, which, aside from obvious cost implications, is subject to a number of stringent requirements in terms of sections 27 to 32 of the said Act and is therefore not practicable.

Further offences for violation of the Act are contained in section 23 which states that any person acting in contravention of section 21 and does any act which could pollute any public or private water, including underground water for any purpose including legitimate uses, shall be guilty of an offence. Any disputes arising from the operation of this Act are to be dealt with by the water court in terms of section 41. The water court is constituted by any judge of the High Court of Namibia sitting in such capacity. The water court has been conferred with the same powers as the High Court and these are wide-ranging. The client may however, should a dispute arise over the application of this Act, elect to be bound by the ruling of the water court in terms of section 50.

The Pollution Control and Waste Management Bill

This Bill was proposed in 2001 but as of the first ESIA had not yet come into effect. It is however an adequate guideline for activities that may cause pollution and waste that must be managed. It is thus considered relevant to briefly highlight certain of the provisions therein contained that may have a bearing on the proposed project.

In essence the Bill aimed to promote sustainable development and provides for the establishment of the Pollution Control and Waste Management Agency (hereinafter "the Agency") that will endeavour, *inter alia,* to effectively control and prevent pollution in Namibia. The Bill prevents and regulates the discharge of pollutants to the air, water and land. The Bill furthermore, *inter alia*, regulates noise, dust and odour pollution and establishes a framework for integrated pollution prevention and control.

Section 21 of the Bill stipulates that no person shall discharge or cause to be discharged any pollutant to the air from a process except under and in accordance with the provisions of an air pollution license issued in terms of section 23 of the Bill. Prior to the issuing of the license the competent licensing authority must be satisfied that, *inter alia*, the applicant has taken the best practicable measures of reducing and preventing the discharge of pollutants to the air.

It should be noted that in terms of section 20 of the Bill the Minister may, on recommendation of the Agency, and where it is necessary to reduce levels of air pollution, declare any place or area in Namibia to be an air quality action area. Following such a declaration, the Agency, in collaboration with the relevant local authority will prepare, adopt and implement a plan to improve air quality in that particular area. Similar provisions are contained in section 32 relating to water quality areas.

Similarly, the Agency shall, in terms of section 30 of the Bill, undertake and co-ordinate the monitoring of water quality in Namibia. Section 33 (1) is pre-emptory in that it provides that,

subject to section 34 (4) of the Bill, no person shall cause or permit the discharge of pollutants or waste into any water of watercourse. Severe criminal penalties are prescribed for offenders. The term "..*any water or watercourse*" includes the sea, natural watercourses, whether or not located on private property and artificial watercourses. Section 33 (1) does not apply to the discharge of non-hazardous domestic waste from private dwellings and to the discharge of pollutants or waste to a sewer treatment works which is maintained by a local authority council, in accordance with a permit issued under drainage regulations issued by that local authority council.

Section 35 makes provision for the obtaining of a water pollution licence, whilst section 36 lists the considerations to be taken into account by the Executive Director in determining each application for the aforesaid licence.

Part IV of the Bill makes provision for integrated pollution control. Section 43 (1) of the Bill provides that:

> "In the Minister, on recommendation of the Agency and after consultation with the Ministers responsible for health and social services, and water affairs respectively, considers that a process creates a risk of pollution to more than one environmental medium and that such a risk could be reduced by adopting an integrated approach to pollution control and licensing, the Minister may by regulations specify that process to be a prescribed process."

No person is permitted to undertake a prescribed process except in accordance with the relevant provisions of an Integrated Control Licence required in terms of section 44 (1) of the Bill. Section 46 lists the considerations to be taken into account by the Executive Director in determining whether or not such a licence will be granted. One of the paramount considerations is the degree to which the applicant has employed the best available techniques not entailing excessive costs for preventing the discharge of prescribed substances into the environment, or where that is not practicable by such means, for reducing the discharge of such substances which are so discharged; and for rendering harmless any other pollutants which might cause harm if discharged into the environment. The license may naturally be issued subject to prescribed conditions.

Section 52 of the Bill provides that:

"No person may cause, permit or carry out any activity that gives rise to noise, dust or odour to the extent that, in the opinion of the competent authority, it creates or is likely to create a nuisance. "

"Competent authority", for the purposes of this section refers to the local authority council in relation to noise, dust and odour generated within the boundaries of its jurisdiction and to the Agency in relation to all other areas.

Section 55 (1) provides that:

"No person may produce, collect, transport, sort, recover, treat, store, dispose of or otherwise manage waste in a manner that results in or creates a significant risk of harm to human health or the environment."

Section 55 (2) of the Bill requires every person that produces, collects, transports, sorts, recovers, treats, stores, disposes of or otherwise manages waste shall take reasonable measures to prevent any other person from contravening section 55 (1). It should be noted that section 58 (1) requires that any person conducting the above-mentioned activities should be in possession of a licence issued under section 62 of the Bill.

In terms of section 56 (1), the Agency is tasked with preparing and submitting to the Minister a draft National Waste Management Plan within three years of the Bill coming into force.

Section 70 provides for a blanket prohibition against the import of hazardous waste into Namibia.

Part VII of the Bill provides for hazardous substances and, similar to the provisions of the Hazardous Substances Ordinance, *supra*, seeks to classify hazardous substances and provides for the control thereof.

The Bill concludes by delineating the provisions of the inspectors appointed in terms of the Bill. It should be noted that the Bill, if enacted, repeals, in their entirety, the following legislation:

1. *The Atmospheric Pollution Prevention Ordinance, 1976*;
2. *The Hazardous Substances Ordinance, 1974*; and
3. Only section 21 of the *Water Act, 1956*.

The Preservation of Trees and Forests Ordinance 37 of 1952

Section 16 of the said Ordinance 37 does however prohibit the setting of fires on any land unless the fire is controllable and purposeful. Furthermore, there is a positive duty on the occupier of a piece of land to take steps to ensure that a fire in "open air" does not spread.

The contractor will also require a permit to remove any protected plant species.

The Forest Act no 12 of 2001

There are no regulations yet active on this Act. The Act however states in Section 22 that it is unlawful for any person to "cut, destroy or remove" any living tree, bush or shrub growing within 100 metres from a river, stream or watercourse on land that is not part of a surveyed erf or a local authority area without a licence.

The site may be affected since there are some dry watercourses on site which may require a licence. This however can be planned and correctly managed.

Civil Aviation Regulations (CARS) Government Gazette No: 2467 (02/01/2001)

The CARS refer to Part 139 of the Aviation Act, No. 74 of 1962 to control the licensing and operations of all aerodromes in Namibia. This must be read in conjunction with Annex14 of the International Civil Aviation Organisation Standards, which define the requirements for determining the Obstacle Limitation Surface (OLS). The OLS restrict the position and height of structures around an aerodrome to ensure safe approach and departure routes for aviation traffic.

The Roads Ordinance 12 of 1972

This ordinance comprehensively provides for the consolidation and amendment of laws relating to roads and matter incidental thereto.

The scope of the Ordinance is vast, encompassing, *inter alia*, specifications regarding the erection of fences along proclaimed road, the erection of motor gates, the erection of animal grids, etceteras. Section 63 may, in the premises, be of particular importance in that it provides that no minor road or private road shall turn off from a trunk or main road at any place other than a place approved by the "*Executive Committee*" (Cabinet of GRN). Recourse may also be had to the Roads Authority (Pty) Ltd. for assistance as regards the construction, regulations and procedure pertaining to the construction of roads.

The Soil Conservation Act 76 of 1969

This piece of legislation aims to *inter alia*, combat and prevent soil erosion and to conserve and improve the manner of soil and vegetation use in Namibia. Therefore, the building of the Wind Park may have relevance with the provisions following of the said Act. Section 3(k) authorises the Minister of Lands, Resettlement and Rehabilitation to direct the landowner to take measures to prevent the erosion, denudation, and disturbance of the land. Therefore, if the operation of the Wind Park is found to cause soil erosion, the Minister may require the client to take necessary steps to minimise such erosion.

The design and layout of the wind park should take into account measures that minimise the potential of erosion due to activities and positioning of the facilities and infrastructure. This can be achieved by minimising the disturbance of the terrain and the vegetation.

The Marine Resources Act 27 of 2000 and subsequent regulations

The Marine Resources Act 27 of 2000 came into effect and repealed Sea Birds and Seals Protection Act 46 of 1973 and its regulations. Various marine bird species are protected by this act also on land (Section 18(1)(b)).

The Public Health Act 36 of 1919 and subsequent amendments

One of the areas regulated by the multi-faceted *Public Health Act, 1919* is the pertinent issue of sanitation and housing. It is important for the client to comply with the provisions listed below, particularly during the construction of the Wind Park when it may be necessary to temporarily house employees or workmen involved with the erection of the Wind Park, access road and power line. Section 119 of the said Act prohibits the existence of a nuisance on any land so owned or occupied by him. The term nuisance is important for the purposes of this EIA in terms of Section 122 in the following regard:

" (a) any dwelling or premises which is or are of such construction or in such a state or so situate or so dirty or so verminous as to be injurious or dangerous to health or which is or are liable to favour the spread of any infectious disease;

(b) any stream, pool… sink, water closet, earth closet, privy, urinal, cesspool, drain, sewer, dung pit, sloptank, ash pit or manure heap so foul or in such a state or so constructed as to be offensive or to be injurious or dangerous to health;

(c) any well or source of water supply or any cistern or other receptacle for water, whether public or private, the water from which is used or likely to be used by man for drinking or domestic purposes or in connection with… any food for human consumption, which is polluted or otherwise liable to render any such water injurious or dangerous to health

(d) any dwelling which is so overcrowded as to be injurious or dangerous to the health of the inmates or which does not conform with any regulations in force in the district as regards air space, floor space, lighting or ventilation;

(e) any area of land kept or permitted to remain in such a state as to be offensive, or liable to cause any infectious, communicable or preventable disease or injury or danger to health; or

(f) any other condition whatever which is offensive, injurious or dangerous to health.

Dwellings that are found not to meet the prescribed standards or which are defectively constructed or dilapidated may be demolished by the Lüderitz local authority in terms of Section 129 of the said Act provided due notice is given to the owner of the dwelling beforehand. Furthermore, the owner of the dwelling is to bear the costs of the demolition of such dwelling(s). It is therefore advisable to ensure that whatever temporary dwellings are erected for workers constructing the road, power line, and Wind Park should be done so in conformity with the abovementioned provisions.

Furthermore in terms of Section 8 of the *Public Health Proclamation 16 of 1936*, where a local authority is of the opinion that a nuisance is seriously offensive or a serious menace to health, it may serve a notice on the owner or occupant of the nuisance to immediately remove the nuisance. Failure to abide by this provision is an offence.

Certain sections of the Act regarding administration are also of importance to the client. Section 10 for instance obliges the client to conform with any additional public health legislation enacted by the Lüderitz authority.

Final Management & Development Plan for Tsau//Khaeb (Sperrgebiet) National Park

This management & development plan sets out the vision, objectives, and guidelines for the management and development of the Tsau//Khaeb (Sperrgebiet) National Park. The project area is located within the Tsau//Khaeb (Sperrgebiet) National Park and will therefore be subject to the management plan and regulations of the park.

The Tsau//Khaeb (Sperrgebiet) National Park was proclaimed in 2008 (Management Plan is attached in Appendix D.)

The Vision of the Management Plan is to protect, manage, and sustainably develop the Tsau//Khaeb (Sperrgebiet) National Park (TSNP) within the context of the greater Succulent Karoo, Nama Karoo, Namib and Coastal Ecosystems, to enhance conservation and socio-economic values for the region and nation and to place primary importance on the globally significant biodiversity and landscape values of the area.

The following objectives are relevant to the project:

- To conserve and wisely manage the landscapes, ecosystems, character and biological diversity of the Tsau//Khaeb (Sperrgebiet) National Park and, where necessary and feasible, to restore and rehabilitate degraded systems to their natural productive states.
- To manage wildlife populations and ecosystems as may be necessary and appropriate to maintain optimal biological diversity and ecosystem stability under highly variable climatic conditions, and to reintroduce and rebuild populations of plants and animals indigenous to the area within historic times (written records, i.e. late 1700s), as might be appropriate under current and changing conditions.
- To promote and support appropriate land and natural resource uses that are compatible with the above objectives, with emphasis on non-consumptive and low impact tourism, strategic prospecting and mining, sensitive and sustainable coastal and marine resource harvesting, environmental education, awareness and outreach initiatives and research, and to create strategic and focused economic opportunities with a focus on poverty reduction, without compromising on sound conservation principles and practices.
- To establish strong co-management partnerships with sister ministries (Mines & Energy, Fisheries & Marine Resources, Lands & Resettlement), Regional Government, private sector (e.g. mining, fishing, tourism, neighbouring landowners and administrators) so as to enhance the management and viability of the greater area within the Succulent Karoo Ecosystem and the transition zones to the adjacent Southern Namib Desert to the north, the Nama Karoo ecosystem to the east and the coastal/marine ecosystem to the west.
- To harness the ecological, social, and economic viability, sustainability and competitiveness of the Sperrgebiet, and to use the Tsau//Khaeb (Sperrgebiet) National Park as an engine for wise economic growth and a model of collaborative management that could be further replicated elsewhere.
- To work harmoniously with the fishing, mining and tourism sectors, both public and private, for the greatest long-term advantage for biodiversity conservation and socio-economic development of the area, the region and the nation.

The Tsau/Khaeb (Sperrgebiet) National Park Management Plan will therefore guide any development that takes place in the park. The project proponent will therefore have to consult and receive approval for the use of the land as well as its primary use, which is to generate electricity from wind. Such rights are embedded in the Lease Agreement between the Ministry of Environment and Tourism and Diaz.

The park zones that applies to the project is as follows:

- **IUCN Category II National Park** (north-western portion) which is managed for conservation and controlled tourism where mechanised access permitted. (Large

natural or near-natural areas protecting large-scale ecological processes with characteristic species and ecosystems, which also have environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities).

- **IUCN Category VI Managed Resource Protected Area** (south-eastern portion) which is managed mainly for the sustainable use of natural resources, e.g. fishing and to ensure long-term protection and maintenance of biological diversity while providing at same time a sustained flow of natural products and services to meet local and national development needs, e.g. mining.

The project is located in the **IUCN Category II National Park** (north-western portion) (Dudley, 2008). This has the following relevant implications:

- The objective is to conserve a functioning ecosystem. Such systems usually cover sufficient scaled areas of sufficient quality. The park size is in line with this and include entire ecosystems of the Lüderitz Peninsula dwarf-shrubland and Lüderitz Plain dwarf-shrubland. The Diaz wind park falls within these two vegetation based ecosystems. Diaz has undertaken to co-operate with the National Parks authority in a process of flora conservation and rehabilitation including the removal of certain potentially sensitive species from areas of high disturbance, transplanting, caretaking of such plants, and eventual replanting.
- Although there are significant fauna and avifauna species activity, these are not limited to this park and the relevant vegetation based ecosystems. Construction of the wind park is not therefore deemed as unsuitable from a disturbance perspective.
- Commercialisation of land, as in the case of the wind park, is not a priority and should be avoided in favour of conservation activities. The challenge is that the wind park is in the boundary of one of only five proclaimed towns along the Namibian coastline and none of the towns have sufficient land for such a development. The remainder of the coastline and bordering desert regions are proclaimed National Parks. Any form of development is therefore inevitably restricted to fall within National Park land. In this case of the wind park, being adjacent to a commercially developed town, Lüderitz, the IUCN 75% guideline would favour the development (Dudley, 2008). Diaz has additionally undertaken to support conservation through protective activities to maintain biodiversity.

International Standards and Guidelines

IFC Performance Standards on Social and Environmental Sustainability

IFC has 8 Performance Standards which must be applied throughout the life of an investment by IFC "*to manage social and environmental risks and impacts and to enhance development opportunities in its private sector financing in its member countries eligible for financing*".

Performance Standard 1 – Social and Environmental Assessment and Management Systems

Performance Standard 1 emphasizes "*the importance of managing social and environmental performance throughout the life of a project*". The management process of "*plan, implement, check and act entails the thorough assessment of potential social and environmental impacts and risks from the early stages of project development and provides order and consistency for mitigation and managing these on an ongoing basis*".

This Performance Standard entails that the client must establish and maintain a Social and Environmental Management System that is applicable to the size and nature of the Lüderitz Wind Park. It is stipulated that the Management System will incorporate a Social and Environmental Assessment, a Management Plan, organizational capacity, training, community engagement, monitoring and reporting. Specifications for these are further discussed under Performance Standard 1. (refer to Appendix A)

Performance Standard 2 – Labour and Working Conditions

Performance Standard 2 acknowledges "*that the pursuit of economic growth through employment creation and income generation should be balanced with protection for basic rights of workers*". According to this Performance Standard a "*sound worker-management relationship is a key ingredient to the sustainability of the enterprise*".

This Performance Standard prescribes that the client will adopt a human resources policy appropriate to the Lüderitz Wind Park that sets out its approach to managing employees in consistence with the IFC requirements. Specifications for managing employees are further discussed under Performance Standard 2 (refer to Appendix A).

Performance Standard 3 – Pollution Prevention and Abatement

Performance Standard 3 recognizes "*that increased industrial activity and urbanization often generate increased levels of pollution to air, water and land that may threaten people and the environment at the local, regional and global level*". It outlines "*a project approach*" towards "*pollution prevention and abatement*" in line with "*internationally disseminated technologies and practices*".

The implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the Social and Environmental Management Systems and must be incorporated therein. The requirements are outlined in Performance Standard 3 (refer to Appendix A).

Performance Standard 4 – Community Health, Safety and Security

Performance Standard 4 "*acknowledges the public authorities' role in promoting the health, safety and security of the public*", but "*addresses the clients responsibility to avoid or minimize the risks and impacts to community health, safety and security that may arise from project activities*".

The implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the Social and Environmental Management Systems and must be incorporated therein. The requirements are outlined in Performance Standard 4 (refer to Appendix A)

Performance Standard 5 – Land Acquisition and Involuntary Resettlement

The Project site is situated within the Tsau//Khaeb (Sperrgebiet) and the project does not entail land acquisition or resettlement of communities. This Performance Standard is thus not applicable to this Project.

Performance Standard 6 – Biodiversity Conservation and Sustainable Natural Resource Management

Performance Standard 6 recognizes "*that protecting and conserving biodiversity and its ability to change and evolve, is fundamental to sustainable development*". This Performance Standard "*reflects the objectives of the Convention on Biological Diversity to conserve biological diversity and promote use of renewable natural resources in a sustainable manner*".

The project is located in the Tsau//Khaeb (Sperrgebiet) National Park and within the IUCN Category II - National Park.

The implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the Social and Environmental Management Systems and must be incorporated therein. The requirements are outlined in Performance Standard 6 (refer to Appendix A).

The project is located in an area that is described as:

- Critical Habitat, which require compliance to section 16 to 19.
- Legally Protected and Internationally Recognised Areas, which require compliance to section 20.

The implication of this is that the proponent must prove that:

- No viable alternative exist for the project in the region.

- Avoid measurable adverse impacts, net reduction in the population (regional) of critically and endangered species.
- Management effort must achieve net gains of the relevant biodiversity values.

This requires a Critical Habitat Study, which has been completed and used to guide the final design/layout of the plant to ensure the most sensitive areas are avoided and impacts are therefore effectively managed.

Performance Standard 7 – Indigenous Peoples

Performance Standard 7 recognizes that Indigenous People (*"social groups with identities that are distinct from dominant groups in national societies"*) are often among the most *"marginalized and vulnerable segments of the population"*. Indigenous People are exposed to *"different types of risks and severity of impacts than other communities including loss of identity, cultural and natural resource-based livelihoods"*, etc. On the other hand development projects *"may create opportunities for Indigenous People to participate in and benefit from project-related activities that may help them fulfill their aspiration for economic and social development*.

The applicability of this Performance Standard must be established during the Social Assessment process, while implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the Social and Environmental Management Systems and must be incorporated therein. The requirements are outlined in Performance Standard 7 (refer to Appendix A)

Performance Standard 8 – Cultural Heritage

Performance Standard 8 *"recognizes the importance of cultural heritage for current and future generations"*. The implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the Social and Environmental Management Systems. The requirements are outlined in Performance Standard 3 (refer to Appendix A)

IFC Environmental, Health and Safety Guidelines for Wind Energy

IFC further provides Environmental, Health and Safety Guidelines for industry specific projects. These sector specific guidelines should be used in conjunction with the IFC General Environmental, Health and Safety Guidelines when the EA is conducted and the Environmental and Social Management Systems are designed.

The Environmental, Health and Safety Guidelines for Wind Energy were updated in August 2015 and bear relevance on the project in the following way:

- Biodiversity value. In this case Key Biodiversity Areas and Important Bird Areas are to be considered. This require biodiversity studies of:
    - Critical Habitat Study
    - Longitudinal Bird Impact Study

Equator Principles of June 2006

Principle 1: Review and Categorisation

States that as part of its internal social and environmental review and due diligence, the proponent will categorise the project based on the magnitude of its potential impacts and risks in accordance with the environmental and social screening criteria of the International Finance Corporation.

According to the Equator Principle classification the project is a Type B project with potential limited adverse social or environmental impacts that are few in number, generally site-specific and readily addressed through avoidance and mitigation measures.

Principle 2: Social and Environmental Assessment

If the project is classified as Category A or Category B, the borrower shall conduct a Social and Environmental Assessment ("Assessment") process to address, as appropriate and to the EPFI's satisfaction, the relevant social and environmental impacts and risks of the proposed project with propose mitigation and management measures relevant and appropriate to the nature and scale of the proposed project. This assessment fulfils this requirement

Principle 3: Applicable Social and Environmental Standards

For projects located in non-OECD countries, the Assessment will refer to the then applicable IFC Performance Standards (Exhibit III) and the then applicable Industry Specific EHS Guidelines ("EHS Guidelines") (Exhibit IV).

The Assessment will establish to a participating EPFI's satisfaction the project's overall compliance with, or justified deviation from, the respective Performance Standards and EHS Guidelines. The Assessment process should address compliance with relevant host country laws, regulations and permits that pertain to social and environmental matters.

This EIA fulfils the requirement of the Environmental Management Act of 2007 and the Namibia's Environmental Assessment Policy of 1995 (Government of Namibia, 2007)

Principle 4: Action Plan and Management System

For all Category A and Category B projects the borrower shall prepare an Action Plan (AP) which addresses the relevant findings, and draws on the conclusions of the Assessment. The AP will describe and prioritise the actions needed to implement mitigation measures, corrective actions and monitoring measures necessary to manage the impacts and risks identified in the Assessment. Borrowers will build on, maintain or establish a Social and Environmental Management System that addresses the management of these impacts, risks, and corrective actions required to comply with applicable host country social and environmental laws and regulations, and requirements of the applicable Performance Standards and EHS Guidelines, as defined in the AP.

This EIA is accompanied by an Environmental and Social Management Plan that complies to the necessary legal requirements of Namibia.

Principle 5: Consultation and Disclosure

For all Category A and, as appropriate, Category B projects the government, borrower or third party expert has consulted with project affected communities in a structured and culturally appropriate manner. The Assessment documentation and AP, or non-technical summaries thereof, will be made available to the public by the borrower for a reasonable minimum period in the relevant local language and in a culturally appropriate manner.

The borrower will take account of and document the process and results of the consultation, including any actions agreed resulting from the consultation. For projects with adverse social or environmental impacts, disclosure should occur early in the Assessment process and in any event before the project construction commences, and on an ongoing basis.

Diaz has undertaken a full public consultation process, described in Section 4 of this report, and adhering to the standards set above.

Principle 6: Grievance Mechanism

For all Category A and, as appropriate, Category B projects, to ensure that consultation, disclosure and community engagement continues throughout construction and operation of the project, the borrower will, scaled to the risks and adverse impacts of the project, establish a grievance mechanism as part of the management system.

This will allow the borrower to receive and facilitate resolution of concerns and grievances about the project's social and environmental performance raised by individuals or groups from among project-affected communities.

The Environmental and Social Management Plan for the project includes the requirements and criteria for the grievance mechanism.

Principle 7: Independent Review

For all Category A projects and, as appropriate, for Category B projects, an independent social or environmental expert not directly associated with the borrower will review the Assessment, AP and consultation process documentation in order to assist EPFI's due diligence, and assess Equator Principles compliance.

Envirodynamics has provided an independent review of the disturbance; thereafter, the Government of Namibia reviews or appoints a reviewer of the EIA Report in the process of issuing the environmental clearance certificate.

Principle 8: Covenants

For Category A and B projects, the borrower will covenant in financing documentation:

- to comply with all relevant host country social and environmental laws, regulations and permits in all material respects, the AP during the construction and operation of the project in all material respects
- to provide periodic reports in a format agreed with EPFIs and provide representation of compliance with relevant local, state and host country social and environmental laws, regulations and permits;
- to decommission the facilities, where applicable and appropriate, in accordance with an agreed decommissioning plan.

The Environmental and Social Management Plan includes the requirements and criteria for reporting.

Principle 9: Independent Monitoring and Reporting

To ensure ongoing monitoring and reporting over the life of the loan, EPFIs will, for all Category A projects, and as appropriate, for Category B projects, require appointment of an independent environmental and/or social expert, or require that the borrower retain qualified and experienced external experts to verify its monitoring information which would be shared with EPFIs.

Diaz has provided for an external environmental and social expert in its staffing/budget plan to oversee implementation of the ESMP.

Principle 10: EPFI Reporting

Each EPFI adopting the Equator Principles commits to report publicly at least annually about its Equator Principles implementation processes and experience, taking into account appropriate confidentiality considerations.

International Conventions

There are two conventions that are relevant to this project and although the client is not legally obliged to perform this project in conformity with the provisions of these conventions, it may be in the financial interest of the client to adhere to the relevant provisions thereof.

The Earth's biological resources are vital to humanity's economic and social development. As a result of the growing awareness and need for international regulation of the protection of biological diversity the United Nations Environment Programme (UNEP) convened the Ad Hoc Working Group of Experts on Biological Diversity in November 1988 to explore the need for an international convention on biological diversity. The move towards international regulation eventually culminated in the Nairobi Conference for the Adoption of the Agreed Text of the *Convention on Biological Diversity* (hereinafter "the Biodiversity Convention") on the 22nd of May 1992.

The Biodiversity Convention was opened for signature on 5 June 1992 at the United Nations Conference on Environment and Development (the Rio "Earth Summit"). Namibia signed the Convention on the 12th day of June 1992 and ratified it on the 16th day of May 1997.

Essentially the Biodiversity Convention was inspired by the world community's growing commitment to sustainable development and represents a step forward in the conservation

of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising from the use of genetic resources.

The objectives of the Biodiversity Convention are as follows:

"…. the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding. "

"Biological diversity" is defined in the Biodiversity Convention as meaning:

" … *the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.*"

Although the proposed project does, prima facie, not impact on biological diversity, caution should be taken, particularly on construction sites, to ensure that biodiversity considerations are borne in mind.

Diaz is addressing this through a biodiversity programme with the National Parks authority that will involve the removal of certain potentially sensitive flora species from the site prior to commencement of construction, the protection of such species in a project-funded nursery, and the subsequent transplanting of the species to suitable alternative permanent habitats within the National Park.

Furthermore, it should be noted that the Convention on Wetlands of International Importance especially as Waterfowl Habitat (hereinafter "RAMSAR") and the Biodiversity Convention are closely linked. RAMSAR is based on the recognition of the fundamental ecological functions of wetlands as regulators of water regimes and as habitats supporting a characteristic flora and fauna, especially waterfowl and that wetlands constitute a resource of great economic, cultural, scientific, and recreational value, the loss of which would be irreparable.

The importance of wetlands for the conservation of global biodiversity and the need to make the best use of scarce resources by promoting synergy between the work of environment-related conventions ultimately resulted in the Memorandum of Co-operation between the two Convention (RAMSAR and Biodiversity Convention) secretariats.

In terms of Article 1 of RAMSAR each Contracting Party shall designate suitable wetlands within its territory for inclusion in a List of Wetlands of International Importance, hereinafter referred to as "the List" which is maintained by the bureau established under Article 8.

Article 3 (1) further provides that the Contracting Parties shall formulate and implement their planning so as to promote the conservation of the wetlands included in the List, and as far as possible the wise use of wetlands in their territory.

Wetlands included in the List acquire a new status at the national level and are recognised by the international community as being of significant value not only for the country, or the countries, in which they are located, but for humanity as a whole. RAMSAR entered into force in Namibia in Namibia on the 23rd day of December, 1995

The following areas in Namibia are included in the RAMSAR List:

Etosha Pan, Lake Oponono &		
Cuvelai drainage	600,000ha	19°15'S 015°30'E
Orange River Mouth	500ha	28°40'S 016°30'E
Sandwich Harbour	16,500ha	23°23'S 014°29'E
Walvis Bay	12,600ha	23°00'S 014°27'E

The project is not expected in any fashion, to have a bearing, albeit indirect, on the protected sites.

7 Project Description

History of the project

The Diaz Wind Farm project is a proposed alternative energy development based on wind electricity generation. The wind farm will consist of initially 11, and subsequently (in future potential phases) up to 16 wind turbines, with a total initial contracted output of 44MW.

Namibia is presently supplying its electrical energy needs from energy sources at Ruacana (Hydro – 240MW) which suffers from intermittent output driven by hydrological fluctuations, Windhoek (Van Eck - coal-thermal – 120MW) which is an aging and polluting facility, Walvis Bay (Paratus – diesel – 24MW) and Eskom/SAPP imports (approximately 50%), which are not secured in the long-term and are expensive.

Except for the renewable energy from Ruacana Hydro Power Station, all the other sources of electricity, including the Eskom imports, are generated at thermal facilities that contribute largely to the greenhouse effect of global warming through the emission of gasses i.e. CO2 and NOx.

In pursuit of the global trend towards the supply of "cleaner" energy, NamPower, in conjunction with the Ministry of Mines and Energy (MME), considered constructing a pilot wind park in the vicinity of Lüderitz. The aim was to ascertain the technical, economic, and environmental viability of erecting and operating wind parks in Namibia.

Consequently a **feasibility study** was conducted to identify an ideal location for a wind park in Namibia by the Deutsche Energie-Consult Ingenieurgesellschaft (DECON). The site-selection process included specific consideration of proximity to human settlements, avian patterns and migration, as well as the general habitat.

The study indicated that all the elements for successful and sustainable production of electricity from wind are in place and that the Lüderitz area is the most promising in terms of site characteristics and economic viability.

Four possible sites in the Lüderitz area were originally identified that had suitable wind conditions. After careful consideration and investigation of obvious environmental impacts it was decided that the **Grosse Bucht location (the current site, see Map 1) was the most acceptable site** and it has the highest production capacity, thus providing maximum potential benefit. **A full-fledged Environmental Impact Assessment (EIA) was performed for the site.** The consideration of various sites for the project is in line with IFC Performance Standards for impact mitigation/avoidance.

Although it was understood at the time of the initial project feasibility launch that a wind park at Lüderitz would not be able to compete economically with present sources of generation on a level playing field at that stage, it was still the intention of the Government and its other participants to promote the project given the significant environmental benefits versus other power generation sources.

In **2007 Aeolus Power Generation Namibia received a license to generate wind energy** in Namibia. Aeolus Power Generation Namibia is a Namibian company, which is a Joint Venture between United Africa Group (Pty) Ltd and Aeolus Associated SA. It is envisaged that NamPower will purchase electricity from Aeolus Power Generation Namibia if they reach a Power Purchase Agreement.

The final stage of development commenced from 2010 onwards, when the current group of companies joined efforts to pursue the full development of the Grosse Bucht site under the name of Diaz Wind Farm.

It should be noted that following COP-21 and undertakings by the Namibian Government to meet clean energy targets, the significance of the project, as the largest renewable energy generation project currently planned in the country, is elevated.

The project site selection and EIA development process can therefore be summarised as follows:

Table 1 Timeline of the project and environmental assessment development

Timeline	*Activity*	*Outcome*
1999	MME/GTZ TERNA Programme	Evaluated the viability of a wind park at Walvis Bay and Luderitz. The Luderitz option showed higher potential. At Luderitz three alternative sites were identified: Golf Course, Reservoir and Grosse Bucht (current site).
	Deutsche Energie-Consult Ingenieurgesellschaft (DECON)	Alternatives evaluated in terms of human settlements, avian patterns and migration, general habitat. Screening report favoured Grosse Bucht (current site).
2001	First EIA	EIA was conducted on Grosse Bucht (current) site. This EIA was not submitted for approval to DEA
2007	Licence to generate electricity formalised	Licence to generate electricity awarded to Aeolus Power Generation Namibia
2008	National Park status awarded	Tsau//Khaeb (Sperrgebiet) National Park was established. IUCN Category II apply to project area.
2011/12	EIA Update 1	• Extensive changes to the site size and technical components justified a major update of the EIA. • IFC and World Bank criteria incorporated. • New archaeology, vegetation and bird studies conducted and incorporated in the EIA • Zoned the project area to align with significant impact and cumulative impact avoidance and mitigation measures.
2016	ERM Review	• Comments on UICN Cat II status of the National Park and its implications. Recommended a Critical Habitat Study and longitudinal bird impact study.
2017/18	EIA Update 3	• Clarification of IFC guideline compliance, IUCN II • Addition of Critical Habitat Study. • Initiated longitudinal bird impact study.

Project locality

The project is located to the south-east of the town of Lüderitz in the Sperrgebiet diamond protection area and Tsau//Khaeb (Sperrgebiet) National Park (see Figure 1).

The site is situated about 12km south of Lüderitz and about 8km south of the airport. The size of the overall site is approximately15.99km2 (see Figure 3).

The proponent of the project is:

The Diaz Wind Power (Pty) Ltd is sponsored by the following companies:

- United Africa Group (Namibia),

- Quantum Power (BVI)

Wind Turbine Generator (WTG) description

The project will consist of initially 11 units of wind turbines distributed in the central section of the project area (see **Map 2** Project Area).

Each unit will consist of conical tubular tower type with 3 blades rotor which is a maximum 150m high (see Figure 1 below)

The wind farm is expected to generate approximately 4.2MW per wind turbine. The Electricity Control Board has issued a 44MW generation license for this phase of the project.

Each wind turbine will require 300m (2 [illegible] distance across th [illegible] direction and 600m(7D) distance in the direction of the main wind flow to mitigate wind disturbance.

The electricity power produced from each wind turbine will be stepped up to 33k[illegible] transmitted to the site substation via an internal grid system, where it will again be up to 132kV for exports to the NamPower grid.

Support Infrastructure Requirements

Simple gravel construction roads will be sufficient for the construction and maintenance of the project.

The roads will be constructed according to the road requirements given by the manufacturer of the specific wind turbine to accommodate movement of special vehicles only on prepared road areas.

Additional infrastructure that will be required is:

- A site substation building, this will include warehouse storage and office facilities;
- Overhead transmission line from a site substation to the NamPower Namib Substation;
- Internal cabling for collecting power from each wind turbine to the site substation.

The overhead transmission line between the site and the Namib Substation shall be constructed according to NamPower standards. The EIA for this is covered under a separate study.

Figure 1: Wind Turbine Generator

<u>Substation on site</u>

The substation on site will be constructed to the physical size required to run the 44MW facility. All the facilities will house within a single closed structure, similar to the existing substation in Lüderitz, conservatively estimated to be 10m in width, 15m long and 4.8m tall. Thus an area of 150m^2 will be required for building space.

The substation will require typical facilities to support the activities of personnel on site such as:

- Offices, with ablution facilities and a canteen for up to 15 people.
- Workshops with the capacity to house and repair sections of the WTG.
- Storage sheds with the capacity to house spare equipment and WTG sections.
- The site will require large oil storage tank with leakage containment.
- The water supply will be by means of a water tank (minimum 10 m3, supplied by tanker service).
- The basic toilet facility will be supplied with septic tanks and truck removal services.

Construction Process

The construction process will be as follows:

- The roads and platforms for the wind turbines will be constructed first.
- The turbine and crane foundations will be constructed.
- The sections of the wind turbines will be moved to site.
- The tower sections will then be assembled on site.
- Then the Nacelle will be installed on the top of tower and then rotor with blades will be connected to the Nacelle.
- The substation buildings and storage facilities will be constructed.
- The internal cabling will be constructed.

Many of these works can be performed by Namibian sub-contractors:

The project will require:

- One 600~700 tons main crawler crane (not available in Namibia, so to be shipped from South Africa) and 2 or 3 hydraulic cranes (50 to 100 tons).
- Heavy equipment such as excavators, bulldozer, graders, compactors, and trailers are required during construction and transportation.
- Typical concrete works equipment are required during foundation construction.

Once the overhead transmission line is built, and the electrical equipment in the site substation (power transformers, GIS, metering panels, etc) is installed, commissioning works will start.

Operational Phase

Diaz and NamPower will co-ordinate in relation to the dispatch of the plant, which will be operated for Diaz by the turbine supplier under a long-term O&M agreement to ensure the maximum uptime of the facility. Diaz intends to fully train personnel to perform all operation and maintenance (O&M) activities over time, with expat staff gradually replaced with locally trained personnel as skills and experience are transferred. Periodic maintenance will be performed in co-ordination with NamPower's grid maintenance schedule to limit periods when the facility is unable to dispatch power. Most maintenance activities are limited to inspections, with periodic small and major equipment overhauls. Detailed service activities are attached in Appendix B.

Labour requirements

Depending on the construction progress, the number of people involved in the construction will vary. It is expected that 100+ people will participate in the construction of which 70% will be un-skilled workers, and will create significant local direct and indirect employment opportunities (e.g. port services for imported equipment, materials supplies, catering for labour force etc).

The project will require 15+ people for the operation and maintenance period of wind power plant directly, plus employment through supporting industries, services.

The expected timeline and life cycle for the project

The project will be constructed over a period of 18 months. It is envisaged to start with construction at the beginning of 2019, once financial close occurs, targeted for the end of 2018.

The operational life cycle of the project will be for 25 years from the commercial operation date under the current Electricity Generation Licence, and the signed PPA with NamPower.

Fluids / hazardous materials needed on site

- Hydraulic oil
- Fuel for the different equipment (diesel and petrol)
- Isolating oil in the substation main transformer

Pursuant to NamPower's normal policy, no PCBs will be used.

All fluids/hazardous materials will be managed according to the ESMP, which is reflected in the EPC and O&M contracts.

8 Assessment of Disturbance within the Study Area

The typical size of a standard foundation for a Class I 4.2MW Wind Turbine Generator (WTG) is around 18 m by18 m. In addition, a crane pad in front of the WTG foundation for assembly and installation should be considered.

For the planned WTG type (4.2MW) and hub height (+90m) the usual size of the crane pad is around 40 m in length and 22 m in width.

This means that the cleared area for each WTG construction site must be at least 50m by 50m. In addition a crane assembly section must be cleared along the road for about 100m by 3m wide. If the road is parallel to one of the sides of the construction area, the length of clearing along the road can be reduced to 50m. The total area cleared at each WTG will therefore be 2650m^2. For 11 WTGs an area of 2.92ha will have to be cleared.

The standard road width of internal roads to each WTG location is min. 4.5 m. The road width in curves has to be increased to minimum 8 m. The inside radius bend for long vehicles (tower sections, blades) should be 30 m. The use of bends in the road should therefore be limited to avoid excess vegetation disturbance.

The total length of roads depends on the micro-siting and access road design. If the minimum distance between WTGs are taken as a guideline approximately 7km of road must be cleared. For the internal roads a minimum area of 3,5ha will have to be cleared.

For each turbine the access road and crane pad must be capable for supporting the following loads:

- approximately 70 heavy trucks per turbine (concrete, crane erection, tower parts, blades etc.)
- maximum length around 52 m, required free height 5.0 m
- maximum load per axle 16 t
- maximum overall weight of single transport 165 t (crane)
- maximum soil pressure of crawler crane 25 t/m^2

For the substation and support facility will require an area of about 100m by 100m. This will require that an area of 1ha must be cleared.

In total an estimated 7.5ha must be cleared for the project activities.

The soil structure will therefore deteriorate significantly in the road reserve. This means that the roads will not be rehabilitated until at the end of the project life cycle and only to a limited extent due to permanent structural damage to the soils.

From the above assessments of potential impacts it is clear that at least 7.5ha of the total Project area will be severely impacted such that it is unlikely to recover naturally during the course of the project cycle. The figure of 10ha is used as the basis of discussion for the potential risks and impacts on the biotic components of the environment described and evaluated the following sections. It is a foregone conclusion that the vast majority of degradation will occur during the construction phase with minimal additional impacts during operation and maintenance.

It is important to note however, that the disturbance will be less than 0.05% of the surface area of the immediate surrounding vegetation types, namely the Lüderitz Peninsula dwarf-shrubland and the Lüderitz Plain dwarf-shrubland. Less than 25% of the disturbance will be in the very sensitive Lüderitz Peninsula dwarf-shrubland. The impact is therefore consider to be very limited, and to further mitigate this Diaz has undertaken to work with the Ministry of Environment and Tourism and the National Parks authority prior to and during construction to protect the most sensitive and at-risk flora.

Critical Habitat Assessment

The Critical Habitat Assessment Study reflects the importance of the Succulent Karoo Biome, which emphasise the endemicity of especially plant species (**Appendix E**).

The following table shows the results of the Critical Habitat Assessment.

Table 2: Critical Habitat summary

Habitat type	Assessment	% of WP footprint	No of significant plant species observed	Endemic species			Near-endemic species			Comments on IFC PS 6.17 requirements adherence
				No	No protected	No range restricted	No	No protected	No range restricted	
Lüderitz Peninsula dwarf-shrubland	**Critical**	<25%	43	9	2	7	17	5	na	**See note**.
Lüderitz Plains dwarf-shrubland	**Critical**	>75%	27	8	3	7	9	5	na	**See note**.
Sensitivity	In total an estimated 10ha must be cleared for the project activities									
IFC PS 6.17 requirements Note	• Project alternatives considered identified this site as the site with least potential impacts (see **Table 1**) • It is impossibble to avoid the Lüderitz Plains and Lüderitz Peninsula dwarf-shrubland. • The total footprint in the habitat is less than 0.1km^2. • Impact potential is only during construction and decommision and not adverse. • The Wind Park Vegetation Management Plan will act as Biodiversity Action Plan for the project lifecycle									
Potential impact	Limited reduction of a critical habitat in the Lüderitz Plains (less than 0.06km^2) and Lüderitz Peninsula (0.04km^2) dwarf-shrubland.									

It is clear from the table that **the project is a low footprint activity** in two Critical Habitats.

If one takes into account the overall footprint in the two Critical Habitats combined is less than 10ha or 0.1km^2 the risk to the Critical Habitats is low.

The impact on the habitat will therefore not be aggravated in a significant way than what was originally expected.

9 The Affected Environment

Baseline Summary

The Diaz Wind Power project site is located on the wider Lüderitz Peninsula environment. In addition to the unusual natural conditions, the unusual legal conditions imposed by the Government of Namibia through the Diamond Act have protected the Sperrgebiet from unchecked degradation. Inside the renowned Sperrgebiet - the restricted Diamond Area 1 - the project is located in the newly established Tsau/Khaeb (Sperrgebiet) National Park (declared after the project was launched). IUCN Category II apply to park in general and to the project area, which makes the affected environment of particular environmental significance.

While the study area is just inside the restricted area, it is in no way unspoiled or pristine as the mystique of the Sperrgebiet suggests to most. The Germans where quite active in the area during colonial days, as has been Consolidated Diamond Mines (CDM) now known as NamDeb, who have conducted decades of mining activity in the area.

Specialist studies in archaeology, vegetation and limited studies in visual impact, avian and the occurrence of the Brown Heyna have been conducted in analysing the suitability of the site.

Tracks from various periods are present throughout the study area, as is a small degree of rubbish. Evidence of exploration, construction and borrow pits are also obvious.

9.1 Climate

Climate is discussed in the Feasibility Study in reference to the efficient generation of energy from wind. Additional components of climate are commented on in pertinent sections below (i.e. precipitation under hydrology). Field-team members feel, however, that a brief discussion of the wind driven sand is necessary.

The eroding power of the wind-driven sand cannot be ignored. Local engineering experts should be consulted by the expatriate design team since the life span of the project and the resultant cost-effectiveness may be directly influenced; this is considered in the O&M strategy for the project. Design engineers could consider some form of protective shrouding on the WTG towers (i.e. rubber or another energy absorbing material). The height of the transport layer of sand will need to be determined in order to accomplish this; the suspended load is thought to be at a relatively low level, considerably below the turbine hub-height, which will therefore not be at risk of erosion from wind-driven sand. The O&M regime for maintaining the turbine towers will however need to account for sand erosion.

9.2 Topography

While not a key environmental issue, the topography is of concern for two reasons. First, placement of the WTGs will depend on height to maximise efficiency. Second, topography will impact visibility, which may be a concern for some members of society.

The area can best be described as undulating hills of metamorphic rock with sandy inlays, with variations slighter than can be represented by the 20 meter contour intervals of a topographic sheet. Geo-referencing in the field with a GPS and a topographic sheet confirmed this.

The preferred placement of WTGs is close to the top of hilltops with significant fetch in the leeward direction. No place-specific efficiency studies were found for any windfarms in the literature review; placements consider geology, topography, balance of plant efficiency, points of connection, together with the wind regime. Ground friction creates a wind-velocity profile where wind is slower at the surface and faster at height, hence the design height of the

turbines. Given the hilly terrain, it is not patently obvious where the ideal placement of the WTGs would be, and the turbine supplier will determine the most effective position for the turbines in the detailed engineering phase.

Long term wind studies by the client have provided a design platform to optimise the positioning of WTGs, which are all to be located in the less environmentally-sensitive zone of the site.

Implication of Topography

Maximising efficiency is in environmental best interest. Ideal placement for maximised efficiency will be challenging given the undulations in the study area and lack of steady climbing leeward hillsides. Field observations of surface-level wind erosion indicate several areas of venturi effect between neighbouring hills. It may be advantageous to investigate these regions that lie parallel to the dominant wind. Also, gullies and large drainages on leeward sides that face the dominant wind may have an amplifying influence on velocity profiles as the wind travels up the terrain. These efficiency investigations should be conducted *keeping in mind the efficiency in that location throughout the rest of the year.* Aerodynamics is anisotropic in nature and, thus, what may be a maximum efficiency spot at one time of year may be low efficiency at others.

Also important to consider is the local peak demands. Most of the power will be supplying local demand through Nampower, and excess will be patched into the main grid. Power losses are directly proportionate to length of transmission line, thus maximum efficiency will be realised when most of the power is consumed in Lüderitz. As such, seasonal demand patterns in Lüderitz and line-losses should also be considered in this process. The shortlisted EPC providers for the project have all undertaken site visits to assess topography, and consider this alongside the detailed wind maps produced using wind data collected from the on-site met-mast.

9.3 Geology and Soils

Background

The focus of the soils investigation was to characterize, at a reconnaissance level, the dominant soil types of the proposed Wind Park area, and to assess the implications of their inevitable disturbance by the construction works of the WTGs, a control building, access road and internal power-line. The potential for soil erosion in particular was evaluated.

Documented information describing the soils of the proposed area proved to be considerably difficult to obtain. In common with material on the biological environmental of the potential impact area, most available information was in the form of general texts relevant to the Namib Desert and to the Sperrgebiet. NamDeb Diamond Corporation, currently controlling mining operations in the area, acknowledged that soils had been sampled and archived for the proposed area. However, requests to access these data sources were denied for reasons of confidentiality. Thus, no documented data describing the soils of the area at any useful level of detail was available to this investigation.

While permit applications had been filed to remove soil samples independent laboratory analysis, they were ultimately refused prior to the site investigation (8/12/00). Fieldwork was therefore restricted to geomorphological and pedological observations of the proposed impact area, to the logging of profiles by sight and to a limited amount of *in situ* field-testing. All such tests used for the determination of soil properties complied with requirements of the revised FAO system of soil classification (FAO/UNESCO/ISRIC, 1988) and land evaluation (FAO, 1991 & 1993). The proposed Wind Park area, demarcated on Map 1 was traversed and nine holes were augured. Five soil pits were logged at 500m intervals along a 2km transect, bearing 315° Northwest from the expected placement of WEC 32 at the southern boundary of the area at 26.7498045 S 15.1800672 E.

The investigation examined pedological conditions and exogenic environmental factors occurring in an area which yielded very limited evidence of ongoing soil formation and development processes. This concurs with the view of Eckardt & Spiro (1998) who found a scarcity of climatic indicators describing current environmental conditions and processes outside the aeolian dune systems in the Central Namib Desert.

Principal Land Unit

The Windpark area is located in the southern coastal belt of the Namib Desert, lying approximately 6km inland at an elevation range of 100-200 m.a.s.l. This land system contains two principal land units and one significant land facet, defined as Gravel plains Ia. Incipient surface drainage network and Rocky Outcrops and Exposures.

Gravel Plains

Extensive gravel plains dominate the eastern portions of the area, running in a northerly direction from the western base of hill 184. To a lesser extent they are found in the northern part of the demarcated area. These plains are considered to be relatively stable deflation surfaces; the products of an extremely slowly weathering regolith profile. Under the hyper-arid climatic conditions prevailing in the area the depth of bedrock weathering would not be expected to be deep. This was confirmed qualitatively by the field investigation where all 9 augered holes revealed unweathered (fresh) bedrock at less than 80cm depth below surface on the plains areas, with 4 holes recording fresh bedrock at less than 40cm depth.

Minimal *in situ* weathering combined with wind-driven erosion of the bedrock has given widespread rise to a permanent surface 'desert pavement' predominantly consisting of biotite pebbles and gravels. Co-residing on the pavement although neither extensively nor permanently, lie medium fine to very coarse sands differentially deposited by wind action.

Ephemeral Drainage Courses

Lying flat to gently sloping at gradient of ca. 1%, the gravel plains are currently subjected to sporadic flood events and frequent high magnitude easterly Berg winds. This has produced wind-streaks, ventifacts and an incipient, shallow ephemeral drainage network covering more than 10% of the surface area of the gravel plains as a whole.

The drainage courses are discrete and discontinuous (between 0.3 and 1.2km in length), confined to areas of incision broadly parallel to basal slopes of ridges and outcrops, and tend to peter out at a network density of 2-4 tributaries. Whilst the basic channel morphologies suggest that they were initiated by water erosion during more pluvial past climatic conditions, the rare flood events of the present climatic regime combined with an almost constant surface scouring by high velocity wind action barely produce sufficient transportation capacity to maintain indistinct shallow channel geometries. These features in fact currently show evidence of slow in-filling, acting as troughs into which wind-blown sands are deposited.

The significant lack of water erosion was confirmed indirectly at two borrow pits located just south of hill 184 where, despite excavation slope angles of up to 27°, no evidence of gullying, rilling or soil creep could be found. Here too, thin patchy deposits of wind-blown sands lined the bottom and slopes of the excavated hollows.

Rocky outcrops and exposures

Numerous gneiss outcrops lie scattered across the gravel plains, giving way to massive convex sheet rock exposures towards the north and west of the proposed Windpark area. Within this land unit shallow pockets of gravelly sands collect in fissures, deposits of winnowed fine sands occupy leeward

Geology

The geology of the proposed impact area is dominated by Precambrian Damara Orogen consisting of the Namaqualand belt of metamorphism and granitisation and including biotite augen gneisses. The area is host to post-tectonic granite intrusions and is covered by thick largely undifferentiated Tertiary sediments, which are in turn host to halite, calcrete and gypsum accumulations.

Soil Types and Environmental Conditions

Lithosols

Pit observations revealed no clear evidence to prove the existence of definable surface soil types. Classification was terminated at the soil group level on the grounds of insufficient depth and the fact that observable particle size distributions fell outside the recommended limits set for the determination of textural class.

Below the almost ubiquitous gravelly desert pavement covering the gravel plains, field textural analyses revealed up to 30% content of fine material (< 53µ) admixed with very coarse sands and gravel sized particles in no clear-cut layering sequence. This matrix, although just falling within size categories required to define soil was nevertheless disqualified for classification as the fine material indicated raw mica particles more closely characteristic of barely weathered regolith.

Lithological boundaries were however observed between the shallow surface matrices and fresh rock. To that extent surface 'soils' were consistent with group diagnostic requirements of Lithosols.

Paleosols

It was outside the scope of this investigation to explore the occurrence of subsurface paleosols although it should be noted that in situ carbonate tests indicated the presence of thin calcic lenses buried from 20cm downwards within what appeared to be weathered regolith at three of the pits. Gypsic layering also appeared to be indicated where cemented and indurated layers were observed in regolith from 30cm depth downwards at two pits in which the field testing of carbonates yielded negative results. Whereas the presence of these enriched horizons were evident in all cases, the use of these properties was rejected for classification purposes on the grounds that the soils were both shallow in any case to merit taxonomic categorization.

The occurrence of pedogenic gypsum

Ward (in Eckardt & Spiro, 1998) noted the presence of gypsum in Diamond Area 1 south of Luderitz. The conclusions drawn from Eckardt *et al* are summarized below in order to shed some light on the environmental significance of gypsum with respect to expected soil disturbances caused by the proposed construction works.

Gypsum occurring in the area is reported to be largely of the pedogenic variety, forming a widespread and shallow but variable subsurface feature of low purity (not exceeding 26% by content), with preferential near-surface concentration in the gravel plains cover. With respect to the proposed Windpark site, conclusions drawn from the limited testing of auger holes and soil pits during the present investigation appear to confirm this presence of pedogenic gypsum within shallow regolithic layers protected from surface exposure by a stable covering of desert pavement.

When exposed by deflation processes the gypsum is prone to dispersal in a westerly direction by the high easterly winds and rare flood events, a point which should be borne in mind when considering the degree of exposure likely to caused by all construction works.

It should be noted that the accumulations in the area, although widespread, have limited surface exposure. The bulk of the gypsum is stored in upper horizons of colluvium, cementing angular clasts and forming mesocrystalline and alabastrine gypsum. Lower horizons show pronounced accumulations of more soluble halite and a distinct absence of gypsum.

It is generally assumed that the pedogenic accumulation of gypsum is ongoing and closely linked to the latest Namib Desert phase, estimated to be 5-10 million years old. In terms of present environmental conditions, the current phase of hyper-aridity in the Namib Desert may represent a stage of dormancy and pedogenic gypsum preservation with limited formation and alteration. However, a terrestrial recycling of sulphates would be expected through aeolian transport under conditions favouring gypsum exposure.

Implications of Soil Findings

Construction works undertaken for the development of the proposed Windpark would necessarily cause a significant amount of physical soil disturbance and removal. The principal implications of such disturbances depend in the first instance on the spatial extent to which the desert pavement covering the gravel plains is broken up to expose previously protected under-surface lithosols and gypsiferous regolith to surface processes. Secondly, consideration must be given to the effects of both lithosol and regolith exposure on changes in soil properties.

Field tests indicated that the textural fabric of the lithosols contain high proportions of fine micaceous particles. Their continued presence in the soil matrix is, without doubt, largely attributable to the protective properties of the desert pavement surface cover and to the properties of pedogenic gypsum as a bonding and cementation agent. These properties effectively increase the resistance of otherwise highly erodible particles to both water and wind erosion.

To break up the surface protection would significantly increase the erodibility of the profoundly immature lithosols/regoliths by the following sequence:

1. Exposure to common fog occurrences. Olivier (1995) reported that common fog occurrences along the coastal belt of southern Namibia may produce significant precipitation, approaching 200mm per annum. Whilst the erosivity of fog would certainly be negligible, the frequent precipitation of small amounts of moisture on exposed horizons enriched by gypsum may favour the accelerated dissolution of sulphates and their consequent reduction in capacity to hold fine particles in place.
2. Exposure to frequent high velocity wind conditions. Exposed fine soil particles freed from bonding agents are preferentially transported off site by aeolian processes, leaving a residual mineral matrix of inert totally infertile coarse sands and gravels. This residual surface would inevitably experience an increase in resistance to further aeolian erosion processes due to the rapid winnowing out of finer particles.

One indirect corollary of on-site increased vulnerability to erosion processes is the off-site potential for secondary enrichment of sulphates and carbonates. In the case of the Wind Park area the dynamics of aeolian transport and re-deposition of exposed gypsum are not known, although judging from current depositional evidence the areas most likely to experience local enrichment would include the channel floors of the ephemeral drainage courses and the leeward basal slopes of outcrops and exposures. It should be noted that the disturbed area is expected only to extend to a maximum of 75 hectares.

Implications of Geology Findings

Considering the homogeneity and the hardness of the gneiss subsurface, Diaz Wind Power will encounter difficulty in laying down the concrete footings for the WTGs. With a diameter of 13m and depth of 2.5m, the foundation will be 330m^3 in volume and require an equivalent

amount of rock breaking. This will significantly increase the need for heavy equipment and increase construction phase environmental impacts.

Furthermore, given the aridity of the region, it is quite conceivable that the depth of weathering of the rock is very shallow, indicating that the rock hardness is even greater at a small depth. The selected EPC provider will need to consider the optimal foundation design.

9.4 Hydrology

Surface

The Namibian Weather Bureau has 98 years of rainfall data from the Diaz Point gauging station. Over this period, an annual average rainfall of 17.1 mm is recorded, with the highest rainfall over a 24-hour period of 31.0 mm. While the region exhibits evidence of weak drainage channels, it is inconceivable based on recorded rainfall data that these channels are anything but paleo-channels created during a past period when more significant rainfall occurred on a regular basis. Fossil records of aquatic mammals have been found in the Lüderitz region (ancestors to the hippopotamus) indicating that the region was once wet and warm with perennial water courses, approximately 65 million years ago (Grünert, 2000).

Today, the only run-off that could occur would be from the rocky faces of exposed gneiss and granites, which will quickly be absorbed into the sandy inlays or sand filled drainage channels. The time span required for the surface transport of contaminants from the study area to the second lagoon or pans is incalculable but may exceed the natural breakdown period of any hydrocarbon service fluids introduced in limited quantity on the site. Also, wind transport and dispersion of contaminated soils may very well prevent concentration at any one spot.

Sub-Surface

Nothing is known of subsurface water in the study area, but the solid basement of metamorphic rock indicates that there is no viable groundwater in the region. The town of Lüderitz has historically been unable to locate viable groundwater in the region and is dependent on a fossil groundwater source approximately 70km to the north-east. It can be confidently concluded that there is no risk of groundwater resource contamination from activity in the project area.

If groundwater does exist in fissures and fractures in the basement structure, given the close proximity to the sea it is unlikely that the limited quantities available for exploitation would not be in a precarious balance with saline water, thus precluding development for human usage. No springs were identified in the area, thus no known wildlife dependency on groundwater can be concluded.

Implication of Hydrology Findings

The sandy inlays will act as very effective traps for any surface transport of contaminants such as service fluids. Even trace amounts of contaminants could accumulate to potentially hazardous concentrations after years of small discharges and small rain events.

The project is expected therefore to have a negligible impact upon hydrology.

9.5 Flora

The flora conditions is of a significant concern to the project. Therefore the project area was subjected to a specialist vegetation study at the end of 2010 and a Critical Habitat Assessment Study (2017) by Colleen Mannheimer (see Table 2 in Chapter 8 and Appendix E)

The following section is abbreviated from the specialist report

The southern Namib Desert comprises the Namibian section of the Succulent Karoo Biome, which is regarded as a global hotspot of biological diversity (Myers et al. 2000), including both plants and animals, and is extremely sensitive in terms of near-endemic, endemic and

protected plant and animal species. It is important in global as well as regional and national terms. This makes only absolutely unavoidable damage acceptable.

Recent assessment by Burke and Mannheimer (2004) indicated that the Sperrgebiet (which excludes Aus) carries nearly 25% of the plant species known to occur in Namibia, making it a national biodiversity hotspot.

Elevated areas such as mountains and koppies are known to harbour many species of conservation concern, making them sensitive to environmental disturbance, some more than others. In addition to on-site damage the creation of obvious access roads promotes illegal access and plant removal by criminal collectors, and is of particular concern as it perpetuates and aggravates existing damage ad infinitum.

The Tsau//Khaeb (Sperrgebiet) Land Use Plan (MET 2001) lists botanical sensitivity in this area as "High", and the work of Burke (2006) regarding management of biodiversity within the Tsau//Khaeb (Sperrgebiet) found the largely rocky north-western section of the project area (Lüderitz Peninsula dwarf-shrubland), which is not being used by the first phase of the project, to have a "VERY HIGH" conservation importance due to a high species diversity as well as numerous protected, endemic and range-restricted plant species, and the more sandy south-eastern section (Lüderitz Plain dwarf-shrubland) to have a conservation status of "HIGH" for similar reasons, although with a slightly lower species diversity. Her zoning is consistent with that discussed in section 4.2 as well as field findings and her terminology for vegetation types will be used in this report.

Two terrestrial habitats (A and B, Map 4) would be affected by the proposed development:

Zone A: Lüderitz Peninsula dwarf-shrubland

The rocky ridges and outcrops and sandy valleys that cover the Lüderitz Peninsula and areas directly to the south and east would be affected by the north-western section of the project. This habitat is characterised by a predominance of low, often succulent, shrubs and perennial herbs, including Brownanthus marlothii, Zygophyllum clavatum, Lycium tetrandrum, Euphorbia chersina and Pelargonium cortusifolium.

Forty-three species were found here, of which more than half are endemic or near-endemic. Of the nine endemic species found on site in this habitat during the study, two are protected and seven are range-restricted (including both of the species that are protected). Lithops optica is of special concern because it is already becoming rarer on the peninsula due to illegal collecting. Euphorbia angrae and E. verruculosa have patchy distributions and are also of high concern. Of the 17 near-endemic species found here, 5 are protected.

This habitat is considered as a critical habitat according to IFC PS 6.17criteria.

Zone b: Lüderitz Plain dwarf-shrubland.

The sandy-gravel plains with low rocky (often quartz) outcrops further to the south and east of Lüderitz would be affected by the south-eastern section of the project.

This habitat is characterised by sandy areas with small hummocks where Zygophyllum clavatum and Othonna furcata dominate together with Salsola c.f. zeyheri and Brownanthus marlothii.

The plains are interspersed with quartz outcrops where Brownanthus namibensis is often dominant, and small succulents, such as Conophytum saxetanum and Psammphora modesta occur together with Pelargonium spp. and Limeum deserticolum.

Twenty-seven species were found here, of which more than 60% are endemic or near-endemic. Of the 8 endemic species three are protected and seven are range restricted,

including all three of the protected species. Of the nine near-endemic species found here, five are protected.

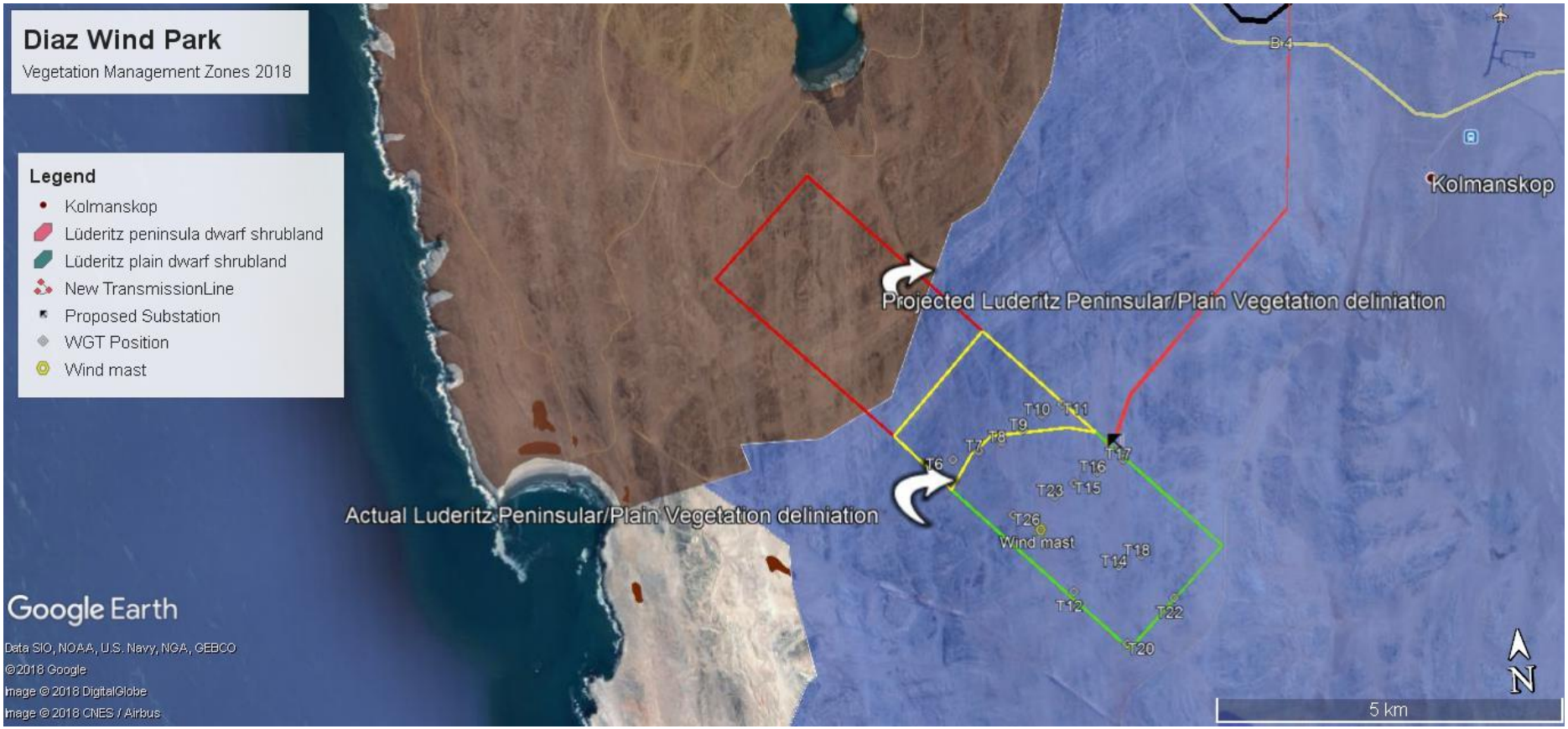
This habitat is considered as a critical habitat according to IFC PS 6.17criteria.

Implication of Flora Findings

From the study it is clear that most of the species of conservation concern are more common in habitat A.

Both vegetation habitats are critical habitats. The Lüderitz Peninsula dwarf-shrubland is extremely sensitive and limited in its range. Therefore any form of development in this habitat should be avoided. This is accomplished by the project layout, which will not place any WTG units in the most sensitive zone. The activities in the Lüderitz Plain dwarf-shrubland should be limited and general movement should be avoided at all cost. Corridors of development which incorporates all infrastructure into groups should be planned before activities start on site.

The site activities should be managed through a Vegetation Management Plan, which forms an integral part of the Environmental Management Plan (see Appendix E).



Map 4: Vegetation Sensitivity Map

<u>All wind turbines are to be located away from the most sensitive zone. A conservation programme supported by Diaz will also help mitigate the disturbance caused by the project through relocating the most at-risk endemic species that are likely to be damaged by construction works.</u>

Inter Consult (2001)/Enviro Dynamics (2012; 2013; 2017; 2018)

9.6 Fauna

Invertebrates

No published references to the invertebrates of the study area could be found. The area is zoned as a low sensitivity area for invertebrates (Walmsley, 2000). During the current fieldwork phase, insect diversity was found to be low, with locusts and beetles comprising the most important groups.

The impact of the Wind Park, control building and power line is likely to have a negligible effect on the invertebrate fauna of the area.

Amphibians

Although 16 species of frogs are expected to occur in the Sperrgebiet, most species are limited in their distribution to the banks of the Orange River. Only the Desert Rain Frog *Breviceps macrops* is expected to occur in the study area (Pallet, 1995; Channing & Griffin, 1993). This localised, endemic species occurs throughout the coastal zone of the Sperrgebiet and survives by utilising fog precipitation for its moisture requirements. As the study area is highly winnowed and is generally a harsh area, the frog population is likely to be very low. No evidence of frogs was found during the current survey.

Given the limited nature of the developments at the proposed site (less than 50 ha will be severely impacted) the frog population is unlikely to be severely affected by the proposed development.

Reptiles

The Tsau//Khaeb (Sperrgebiet) as a whole has a high diversity of reptiles, which is typical of arid areas. The study area is zoned as one of medium faunal sensitivity in relation to reptiles (Walmsley 2000).

Most of the species below are endemic to the region, some have are narrow distribution:

- Many-horned adder Bitis cornuta – very common in the area, mostly on gravel plains
- Horned adder Bitis caudalis – occasional
- Péringuey's adder Bitis peringueyi – uncommon, mostly in loose sand (could have been the "sidewinder track" referred to in the original EIA report)
- Namib Sand Snake Psammophis leightoni namibensis – very common;
- Dwarf Beaked Snake Dipsina multimaculata – occasional to common;
- Western Rock Skink Trachylepis sulcata nigra – used to be Mabuya sulcata nigra; note that the nigra race is a very narrow endemic and pretty much restricted to the Lüderitz area. Occasional to common, mostly in rocky areas/gullies.
- Knox's Desert Lizard Meroles knoxii – very common;
- Plain sand lizard Pedioplanis inornata – very common.
- FitzSimon's Burrowing Skink Typhlacontias breviceps – not often seen (nocturnal and burrowing); mostly in loose sand
- Common Barking Gecko Ptenopus garrulous maculates – very common; mostly only heard, rarely seen. Heard during site visit.
- Southern Rock Agama Agama atra atra – common (subspecies with a narrow distribution).
- Giant Ground Gecko Chondrodactylus angulifer – probably common in the area, but active at night so difficult to estimate.
- Namaqua Chameleon Chamaeleo namaquensis – common to very common.

- The Nama Padloper Homopus - un-common, only found in pegmatite outcrops not found in the project area.

A number of species of reptiles were observed within the study area including several species of lizards, a snake and a species of tortoise. Lizards were the most common reptiles with species such as *Mabuya sulcata nigra*, *Meroles knoxii* and at least two species of *Pedioplanus* being characteristic of the area. Densities were, however, low. A single species of tortoise *Chersina angulata* was found in the area, although the endemic and highly localised Nama Padloper *Homopus sp. nov*. may occur in the area as well (Griffin pers.comm.). Only one snake, probably of the genus *Psammophis* was noted in the study area, but tracks of a small sidewinding adder *Bitis spp.* were also noted in sandy habitats in the lee of Hill 184.

Overall the impact of the Wind Park, control building and power line is likely to have a negligible effect on the reptile fauna of the area. However it is very likely that reptiles will be encountered during the construction phase and some provision should be made in the EMP on how to deal with them. Most reptiles will scuttle away and therefore won't require special action, but Namaqua Chameleons, which are territorial, will usually stand their ground when they feel threatened. Given the superstition surrounding chameleons in some cultures, there should be an explicit point made in the EMP on how to deal with chameleons.

Birds

The movement of birds have a significant influence on the viability of the site. Therefore the project area was subjected to a specialist avian study during 2011 by Jessica Kemper (Appendix F)

The following section is abbreviated from the specialist report

Avian Habitats

Inland habitats:

The diversity of birds throughout much of the Sperrgebiet is relatively low because of the arid nature of the land and the relatively sparse vegetation cover. However, birds are highly mobile and tend to move according to the food source. Years with high rainfall and subsequent availability of food tend to draw large numbers of birds, such as passerines (e.g. canaries), insectivores (e.g. bustards and coursers) and raptors (e.g. kestrels, falcons and owls). In addition, strong easterly winds, most prevalent during winter, may displace birds with a distribution further inland towards the coast. The species most likely to breed on the site of the proposed DWF facility are Rock Kestrel and Tractrac Chat.

Shoreline (sandy and rocky shores, sheltered bays)

The coastline between Agate Beach and Grosse Bucht comprises a mosaic of open sandy beaches, exposed rocky shores, as well as a number of protected bays. Together with the intertidal zone, these areas provide important roosting and foraging habitat for a number of shorebirds, including for birds migrating along the west coast of Africa.

They also provide roosting habitat to several seabirds, such as gulls and cormorants. A few bird species breed on or close to the shore, including Damara Tern, African Black Oystercatcher and White-fronted Plover. The most important hotspots along this stretch of coast, in terms of avifauna diversity and numbers, are Radford Bay, Second Lagoon, Griffith's Bay, the shore between Diaz Point and Guano Bay, and Grosse Bucht.

Second Lagoon wetland

The salt marsh wetland at Second Lagoon is the only notable wetland between Sandwich Harbour near Walvisbay and the Orange River wetlands, both of which are Ramsar sites. Although comparatively small in extent, the Second Lagoon wetland therefore provides crucial roosting and foraging habitat for a range of resident and migratory birds.

The head of the Lagoon, and the associated wetland, is one of the most important avian biodiversity hotspots in the Lüderitz region. Most birds forage and roost in the Lagoon itself, along the mudflat and sandy beach, the salt marsh vegetation and in the channels running

through the wetland. The salt pan behind the wetland occasionally floods partially or completely during spring tides, and some birds may forage there then. Some birds (particularly Kelp Gulls, Greater Flamingos and White-fronted Plovers) may roost on the pan.

Ephemeral freshwater pans, rock pools and drainage lines.

These only fill with water after significant rainfall events, e.g. those of February 2000, April 2006 and May 2011. There are several such small freshwater pans and rock pools on the site of the proposed DWF facility itself, mostly near the southeastern limit, as well as a well-established drainage line near the north-western limit (still found wet with some standing pools of brackish water during the site visit on 29 October 2011). When filled, these water sources are likely to attract several species of birds otherwise not necessarily found in these areas, such as Karoo Eremomela, Yellow Canary, Three-banded Plover, Black-winged Stilt and Pied Avocet. Within the broader impact zone, there are several ephemeral drainage lines, especially along the tarred road close to Lüderitz, along the railway line just south of the public road to Diaz Point, and close to the south-eastern end of the Second Lagoon saltpan, Prominent ephemeral pans are found near Diaz Point, Guano Bay and Grosse Bucht.

Lüderitz Sewage Treatment Plant (including outflow and vlei)

The Lüderitz Sewage Treatment Plant, located at the northern edge of town provides a small artificial wetland habitat. Water overflow from the treatment plant runs in a small stream down a gentle slope and empties into a small vlei. Close to the treatment plant this results in a belt of thick grass and a few dense stands of Phragmites that supports a number of passerines, insectivores, waders, as well as a few secretive species such as Common Moorhen, herons and egrets. The open vlei and its flat sandy banks host some wading birds, as well as flamingos, gulls and ducks.

Local flight corridors

It is highly probable that a number of shorebirds and seabirds regularly commute directly between Second Lagoon and other bays, particularly Grosse Bucht, and that the direct line between Second Lagoon and Grosse Bucht is therefore an important flight corridor. This includes species like Damara Terns who breed behind Grosse Bucht and have been observed foraging and roosting at Second Lagoon. Observation of Damara Terns flying in a straight direction from Second Lagoon towards Grosse Bucht, as well as ringed individuals, known to be breeding at Grosse Bucht and seen foraging at Second Lagoon confirm the importance of this flight corridor. Birds observed or suspected of using this flight corridor are listed in Appendix F. Much commuting, particularly by flamingos and migrating shorebirds, takes place at night; the importance of this flight corridor is thus likely to be underestimated and needs to be confirmed.

Another, possibly less well-defined flight corridor is between the Lüderitz Sewage Treatment Plant vlei and Grosse Bucht and is likely to be used by birds such as Greater Flamingo, Lesser Flamingo, Kelp Gull and South African Shelduck.

Bats

Bats are very restricted in the wider area, and the impact of the project on them can be considered to be negligible.

Though bats may be injured by direct impact with turbine blades, towers, or transmission lines, and recent research shows that bats may also be killed when suddenly passing through a low air pressure region surrounding the turbine blade tips, at this location, only isolated incidences of bats passing through the site can be expected to occur.

Bats are usually active during periods of low wind conditions which limit the potential occurrence of bats in the project area, which is characterised by high wind speeds and wind turbulence.

Map 5: Bird Sensitivity Map

Inter Consult (2001)/Enviro Dynamics (2012; 2013; 2017; 2018)

Birds of importance

The birds of greatest potential relevance and importance in terms of the possible impacts o the proposed wind energy facility are likely to be:

- Flocks of overflying wetland and coastal birds, including flocks of migratory shorebirds numbering from 10 to 100s of birds, commuting between foraging and roosting areas northeast/southwest of the proposed site, particularly between Second Lagoon and Grosse Bucht and, probably to a lesser extent, between the Lüderitz Sewage Treatment Plant and Grosse Bucht. Species of particular concern are Greater Flamingo, Lesser Flamingo, South African Shelduck, African Black Oystercatcher and Damara Tern, all collision-prone, and, to varying degrees, disturbance-prone species.
- Large terrestrial species, particularly threatened and/or endemic species such as Ludwig's Bustard, that are highly susceptible to collision mortality.
- Species with a restricted distribution, such as Barlow's Lark; the presence and/or abundance of Barlow's Lark in the broader impact zone needs to be ascertained.
- Resident and breeding and/or visiting raptors; although the Rock Kestrel is neither threatened nor endemic it is the only raptor regularly recorded breeding in the broader impact zone.

The map above (Map 5) clearly indicates that the north-western boundaries of the site potentially interfere with the coastal flight paths. Other concerns raised are the potential impact on the Ludwig's Bustard.

The Impact Assessment proposes avoidance of the area (Zone1) rather than complex mitigation measures that may fail.

Th recommendations of the ESIA have been adopted, and no WTGs will be installed in the north-western segment of the site (zone 1), thereby avoiding any impact on the bird flight-path.

Mammals

The proposed site for the Wind Park is zoned as low sensitivity in terms of the mammalian fauna (Walmsley, 2000) and is expected to have a low diversity of species associated with it. Several species of large mammal were noted to occur in the area, including Oryx *Oryx gazella*, Springbok *Antidorcas marsupialis*, Brown Hyena *Hyena brunnea,* Black-backed Jackal *Canis mesomelas* and Cape Fox *Vulpes chama.* Most were identified by tracks left in the area, but Springbok and Black-backed Jackal were both seen at the site. Densities were very low and it is presumed that few if any of these larger mammals are resident at the site.

Of potential concern is the evidence of Brown Hyena dens where this species is known to breed. Therefore an information baseline study was conducted by Ingrid Wiesel (Appendix G). The following section summarise this report

The brown hyena's IUCN classification status was increased from Lower Risk – least concern to Lower Risk – Near threatened in 2000. This conservation status and its distribution were last assessed in 2008 (Wiesel et al 2008). The global population size is most likely below 10 000 adult animals and its population is believed to be decreasing as brown hyenas are deliberately and incidentally persecuted, predominately on commercial and communal farmland. The Namibian conservation status is insufficiently known (vulnerable or endangered).

The SNP is one of only four areas where viable brown hyena populations are left (Mills 1990), which highlights the importance of protecting this environment.

As brown hyenas have

- extremely large home ranges,

- a low reproductive rate and
- need large areas to sustain populations

they are threatened by disturbance through land development. The main threats are

- habitat destruction (including storage facilities, substation, wind turbines),
- habitat fragmentation (e.g. construction of roads, access/service roads),
- disturbance (noise, human activity, movement of materials)
- direct mortality (e.g. road mortalities) and
- indirect mortality (e.g. destruction or disturbance of den sites and subsequent decrease of reproductive success).

Den sites, the associated resting habitat and important movement corridors have to be protected in order to protect brown hyena core areas within the proposed wind farm area. Furthermore, access to the north-eastern parts of the hyenas' territory has to be ensured. This is only possible by creating no-go areas within the proposed wind farm area (Map 6). The site layout accommodates this.

Small mammal tracks, noticeably those of gerbils, were noted in the study area, particularly along the weakly developed drainage lines where vegetation is slightly denser than surrounding areas. The mammal fauna of the study site is likely to be disturbed during the construction phase by the noise, dust and general activity during this phase. Once the plant becomes operational it is likely that most mammals will become habituated to the noise of the WTGs and the low levels of activity around the control building and during maintenance operations. Further monitoring of the Brown Hyena activity on site is essential and incorporated in the EIA.

Implications of Fauna

It is especially the territoriality and movement of fauna that is of particular significance. The protection of movement corridors of sea birds and the territorial boundaries of the Brown Hyena is therefore important as it means denying access to and use of the north western section of the site (Map 9).

Map 6: Brown Hyena Sensitivity Map

Inter Consult (2001)/Enviro Dynamics (2012; 2013; 2017; 2018)

9.7 Archaeology

Preliminary archaeological surveys of Diamond Area 1 in the Lüderitz area, by Range (1910) Axelson (1953), Grattan-Bellew (1964) and Davies (1973) led to detailed research by Wendt (1975, 1980) and Noli (1989) which established the archaeological sequence. Additional research has been carried out by Kinahan (1988), as well as by Avery (1985) and Winckler-Holler (1988). The state of archaeological knowledge of the area is summarised in Kinahan & Kinahan (1993) (Appendix I).

Archaeological sites in the Lüderitz area consist mainly of small surface scatters of stone artefacts and artefact debris, as well as small shell middens composed mainly of various limpet species, with osteological evidence of penguin, fish and seals on the more recent sites. Some of these sites are also associated with nomadic pastoralist pottery dating to within the last 2000 years. In addition, several small rock shelter sites have been investigated and a number of burial sites have been excavated.

Field evidence indicates that the area covered by the proposed Windpark has an archaeological sequence spanning the last 300 000 years. However, the sequence is not well dated and cannot be directly compared with that of the broader region (cf. Volman 1984). It is likely that there were significant discontinuities in the occupation of this inhospitable area. Certainly, the Pleistocene finds so far recorded from the northern part of Diamond Area 1 indicate a rather patchy distribution without significant local concentrations.

Holocene archaeological sites from this area suggest a weakly developed transhumance pattern in which Later Stone Age (LSA) hunter-gatherer groups moved between the coast and the interior, possibly following the Koichab system (Noli 1989). These groups and more recent pastoralists came into contact with the first European maritime visitors (Kinahan 1988) from Portugal. Detailed descriptions of indigenous people at Lüderitz are available in the records of 18th century British naval visits (Kinahan 1990). Indigenous occupation of the Lüderitz area appears to have been small in scale and intermittent in character at the time of early colonial occupation.

Mid- to late Pleistocene archaeological occupation of the wind park area was indicated at two sites: QRS 28/ 001 and 008. In the case of QRS 28/ 008, the site is located close to a peg marked WIND 6, assumed to be a possible turbine construction site . The remaining four sites all appeared to be more recent, judging by their state of preservation.

QRS 28/ 006 was a small cairn of fist-sized beach cobbles located within 5m of a group of pegs marking the intended position of a power line bend-point. QRS 28/ 010 was a substantial rock cairn positioned on a gentle west-facing slope. The cairn is suspected to mark the site of a burial, but as far as could be determined in the field, this site will not be affected by construction of the wind park.

Three shell midden sites were also located in the course of the survey. QRS 28/009 was a dispersed accumulation of limpet shells Patella spp in the lee of a low rock outcrop overlooking a shallow rainwater pond. QRS 28/012 was a dispersed scatter of limpet shells in a sheltered drainage line. The shell was extremely friable and appeared to be archaeological rather than modern. However, no stone artefacts were found in association with the midden. At QRS 28/ 011, a further dispersed accumulation of limpet shells was found in the lee of a rock outcrop. In this case the shell was found together with a bipolar hammerstone, fragments of ostrich eggshell and a single microlithic core in crystal quartz, evidence confirming the archaeological association of the marine shell.

A single site of historical date, QRS 28/013 was a scatter of 19th century green bottle glass, including one bottle neck with a wire carrying loop. The general scarcity of historical evidence is noteworthy, in view of the great abundance of such evidence from other coastal and near-coastal sites.

Taken together, the archaeological sites found in the wind park area resemble the material found elsewhere in the Lüderitz area. Background data indicated that the Wind Park area

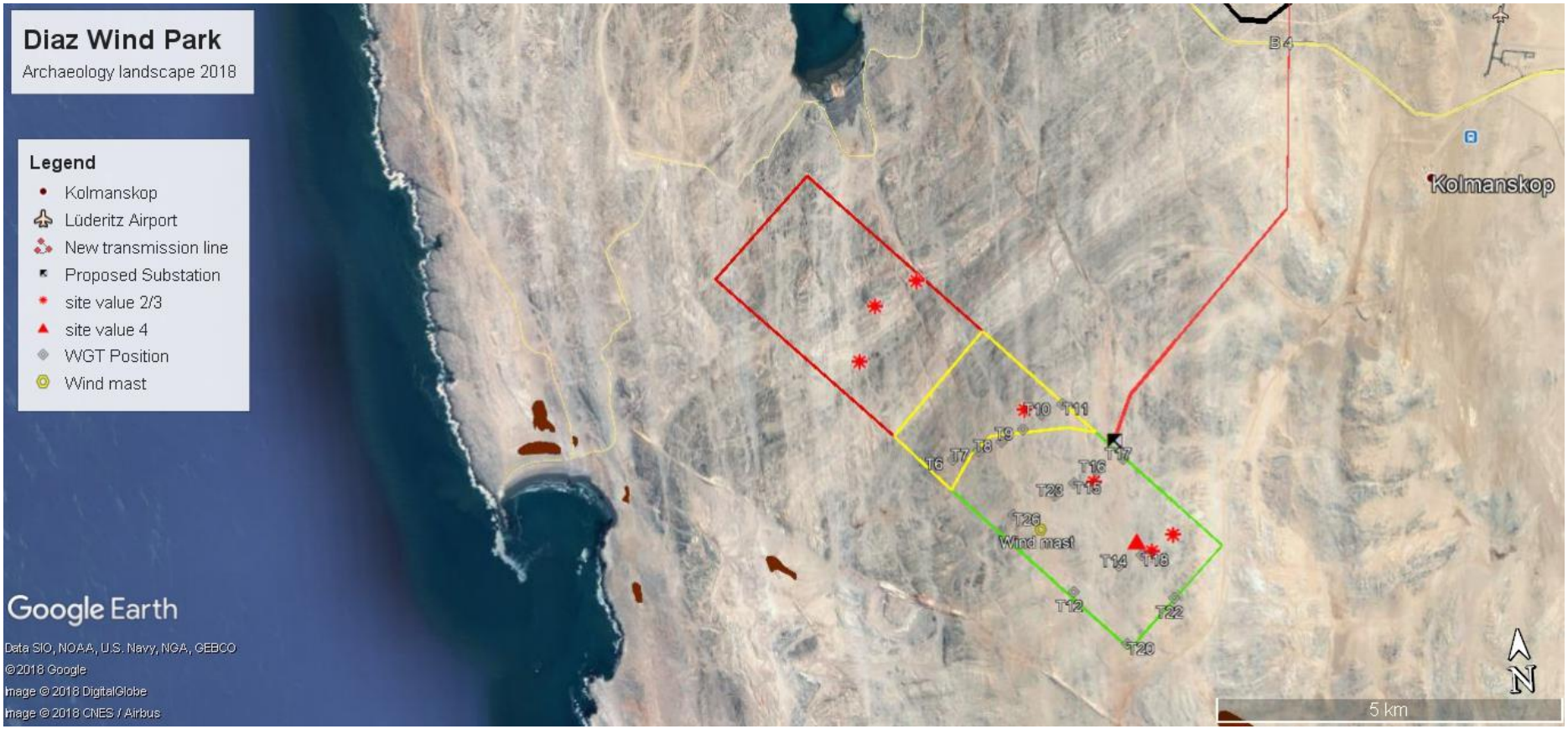
would be unlikely to contain any large or important archaeological sites, and this is confirmed by the survey reported here.

Implications of Archaeology

The study area is considered to have both historic and prehistoric archaeological significance as a landscape, not individual sites. Thus it is strongly recommended that on-site archaeological finds (if any) be physically protected and kept in place as landscape heritage (Map 7). This is a legal requirement in terms of the National Heritage Act of 2004.

9.8 Palaeontology

The palaeontology of the site was not investigated. No information was found in the literature with direct relevance to the potential impact site though, as previously mentioned, fossils from the previous tertiary have been identified in the area. The nearest important palaeontological site is the Fiskus site which lies about 10km to the Southeast of the proposed Wind Park (Walmsley, 2000). German miners who worked in region had a good record for reporting fossil findings and, as there are no reports from the Wind Park site, it is likely to be fossil-free. This would make a full palaeontological study a bit unnecessary at this stage. Furthermore, the potential for the Wind Park to contain any important palaeontological sites is considered to be low, considering the dominant aeolian sands and gravels overlying the metamorphic rock complex (Pallet, 1995).



Map 7: Archaeological Sensitivity Map

Inter Consult (2001)/Enviro Dynamics (2012; 2013; 2017; 2018)

9.9 Noise

The single greatest complaint about Wind Parks is the noise factor. This is a common oversight by many advocates of wind power and has proven to be a problem when not addressed before construction of numerous Wind Parks around the world.

The noise is a combination of two factors, mechanical noise and blade noise. The mechanical noise is created by the gearing and generator and is audible from 100m. The primary noise comes from the blade, created by the compression of air and the impact of the compressed air against the WTG tower. The combined noise for a single WTG (typical) has been measured at 99.8dB and is audible under still (low wind) conditions at 1km, though distances of 1.5km have been reported. In the UK, reports published by The Welsh Select Committee on Wind Park Development in rural Wales concluded that noise limits should be set at a radius of 1500 metres from WECs for residential development (MAIWAG, 2000). This is far below distances for proposed Wind Park.

Manufacturers and developers of WECs have published numerous reports indicating that WECs in operation are inaudible over background wind noise. "In operation" refers to wind speeds above the cut-in speed, which fails to acknowledge that turbines spin and generate noise under lower wind regimes as well. It also fails to mention whether or not the individual is up or down wind. In general, any such statements by economically interested parties should be disregarded.

Since no people live anywhere in the vicinity of the wind park, no social, health or economic impact on people can be considered from the noise created by the WTGs at this site.

The dominant blade noise is a low thumping rhythm, approximately 75 beats per minute (created by 3 blades at rotating at 25 rpm). Residential reports from within 1km of Wind Parks complain of stress and anxiety created by the noise. Given that the proposed Wind Park is 8.5km from the nearest public areas, the impact on humans is not an issue. No literature has been found reporting on the effects of such noise stress on wildlife. A typical pattern of environmental stress on wildlife is the disruption of normal patterns, most importantly reproduction.

The effect on the movement and territoriality of the Brown Heyna is therefore not clear. This project should be used as a baseline to determine the influence of sound on these patterns. Monitoring of these patterns must form part of the EMP.

9.10 Visual Impact

It is argued internationally whether or not visual impact on a landscape is an environmental issue or an aesthetic one. To illustrate this, the new digital clock tower of Windhoek has been publicly ridiculed and called an eyesore, yet no EIA was required for that.

Given the unique landscape of the Lüderitz area and the high value of the tourism market, it was deemed necessary to include visual impact in this study. The full report is available under Appendix H.

The first step was to identify relevant viewpoints This resulted in 10 viewpoints in the Lüderitz Peninsula and one at Kolmanskop. The criteria for choosing these viewpoints are permitted access and tourism significance. The B4 main road has been excluded from this due to high driving speeds and very limited visibility to the south.

The visually sensitive terrain is therefore defined as:

"The visual sensitive landscape consists of the area west of the project site form Lüderitz in the north, via Diaz Point, to Grosse Bucht in the south."

The visual landscape towards the wind park will determine the sensitivity of the receptor. The visual landscape varies little for all the identified viewpoints and is described as:

"The visual landscape consists of pristine desert features consisting of gravel plains with limited features and low-rise rocky outcrops with only rock features. Visible vegetation is negligent."

The following criteria were used to analyse how significant the view of the typical structure will be from each viewpoint:

- Distance to relative size.
- Distance of visibility.
- Scale contrast.
- Spatial dominance.

The distance to relative size criterion.

The results of relative size in the case of the project are that most views will see the wind turbine as between 0.12cm to 0.56cm high. It is only Second Lagoon point and sections of the roads that are exposed to a relative size that is between 0.25cm and 0.47cm.

The wind turbine is therefore of a medium relative size in the area of the Second Lagoon point and the closest sections of DR0701 and DR0733. The relative size of the wind turbines at the other viewpoints is low.

The distance of visibility criterion.

The visibility criterion can change significantly with the change of weather conditions. This means that it is difficult to predict the visibility of the wind turbine structure from each of the viewpoints. A general guideline will be that structures will become less visible after having a perceived width of less than 1mm and invisible after having a width of less than 0.1mm.

The wind turbine will become invisible at a distance of 5km. Again the wind turbines will only have limited visibility at Second Lagoon point and the closest sections of DR0701 and DR0733. The wind turbines will be practically invisible at the other viewpoint.

Scale of contrast.

The scale of contrast is determined by the scale relation of the wind turbine to other structures in the landscape. There are no other structures in the visual landscape therefore the scale will be significant if the wind turbine is visible or of medium relative size.

Spatial dominance

The spatial dominance considers the occupation of space in a visual landscape. The wind turbine only has a significant occupation of space, individually if the structure is visible or of medium relative size.

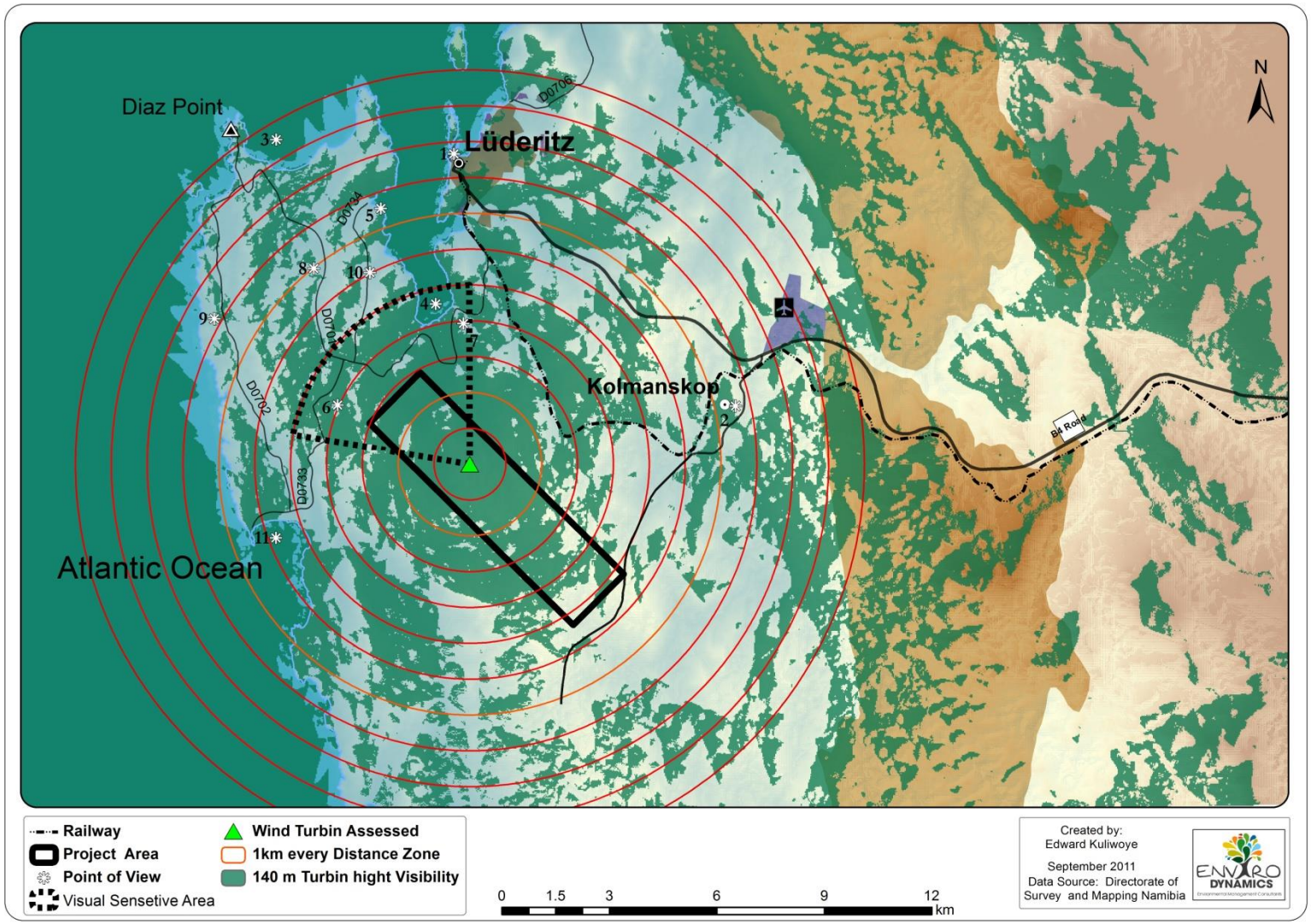
The spread of the wind turbines over the visual landscape is anything from 2km to 4km wide. Considering that the length of the site is 8km the spatial dominance ratio is between 25% to 50%. This can be considered low.

Implications of visual sensitivity

The summary (Map 8) indicates that the wind turbine structures are insignificant to all viewpoints except viewpoints 4, 6 and 7. Only viewpoints 4 and 7 indicate average significance of dominating the visual landscape.

It is therefore only the view around Second Lagoon point that shows a medium sensitivity to any identified visual impact.

The visual impact of the project is considered to be very low compared to most wind farms and other power generation stations. The particularly remote location of the site means that it will have negligible visual impact.



Map 8: Visual Sensitivity Map

Inter Consult (2001)/Enviro Dynamics (2012; 2013; 2017; 2018)

9.11 Social Impacts

Introduction

This section of the report will provide an overview of the receiving socio-economic environment in which the proposed development will take place. It will form the baseline against which potential socio-economic issues and impacts will be identified and assessed. Consequently, only information relevant to this study will be highlighted.

Since the proposed project is located within the Karas region, an overview of the social and economic environments of this region will be provided, as well as that of Lüderitz, the town closest to the proposed development. This section of the report will to a large extent draw on work previously done by Enviro Dynamics cc for the Namdeb, since the project locality is more or less similar, thus also the baseline information (2010).

Overview of the Karas Region

The Karas Region, in the far south of Namibia, is the country's largest, at 161,325 km2, and also the least densely populated (at 0.4 persons per square kilometre, compared to the national average of 2.2 persons per square kilometre). This density is reduced by the Sperrgebiet covering a large section of the region where settlement has been restricted for the last century. South Africa borders this Region on the south and the southeast, Botswana on the east, the Hardap Region on the north, and the Atlantic Ocean on the west (Central Bureau of Statistics, 2004).

It comprises six political constituencies: Keetmanshoop Urban and Rural, Berseba, Lüderitz, Oranjemund, and Karasburg. There are two municipalities governed by Municipal Councils (Keetmanshoop and Karasburg), one governed by a Town Council (Lüderitz), five governed by Village Councils (Bethanië, Koës, Berseba, Tses, Aus), one 'open' mining town (Rosh Pinah) and one 'closed' mining town (Oranjemund). There are also five 'settlement areas' that are directly supported by the Regional Council for administrative purposes, comprising the two border towns of Ariamsvlei and Noordoewer, and the small settlements of Grünau, Warmbad, Koës, Tses, Aroab, Bethanie and Aus (Central Bureau of Statistics, 2004).

Population and Settlement in the Karas Region

According to the final report from the 2001 census (Central Bureau of Statistics, 2003), there were 69,329 residents in the Karas Region as of August 2001, i.e. 3.8% of Namibia's estimated total population of 1,830,330. Projections place the 2010 Karas population at 77,875, which will increase to an estimated 88,612 by 2020. More than half of the population (53,3%) were males and 46.7% were females, compared to 48.5% males nationally, reflecting high levels of male in-migration seeking employment. Of all households in the Karas Region, 35.5% were female-headed (Central Bureau of Statistics, 2004).

Only 60% of the people living in Karas were born there; this reflects the large number of migrants from other areas. Almost 6% of the Karas people came from outside the country. Most of the in-migrants (22.3%) are from the four north-central regions and Kavango, while 3.9% and 3.5% come from Hardap and Khomas respectively (Central Bureau of Statistics, 2004).

The mines in the region attract workers from outside the Karas Region, as do the irrigation farms at Naute Dam and along the Orange River. This migration often leads to extended family structures of people migrating there not only to work in the formal sector, but to provide services through the informal sector to the employed and their families. Although the mines take responsibility for servicing its workers and their extended families through private facilities and by contributing to government services, many of the irrigation farms along the Orange River do little in this regard (National Planning Commission, 2007).

Population growth in the Karas Region has slowed, as it has throughout Namibia. The relatively high prevalence of HIV directly affects the extent and quality of the active labour force of the

country. Compared to national population growth, the Karas Region is growing more slowly, at 1.3% per annum. It is partially due to the fact that a number of spouses of males in the Region live in the northern and central parts of Namibia. At 4.1, household size in the Karas Region is the second lowest in Namibia, compared to a national average of 5.1 (Central Bureau of Statistics, 2004).

Fifty-four percent of the population of the Karas Region lived in urban areas in 2001, well above the estimated national average of 33%. Near the Project Area the urban percentage of the population is significantly higher than for the Karas Region as a whole, with almost all of the area's population living in the coastal towns of Lüderitz and Oranjemund, and the inland town of Rosh Pinah. Following Keetmanshoop, Lüderitz had the second highest population of 13 295, i.e. 19.2% of the Region's estimated total population.

With such a highly-urbanised population, reliance on wage employment is especially significant. This is not only important for the Karas Region itself but also for other regions as the Karas Region is the source of income for many households (especially in the northern regions of Oshana, Omusati, Ohangwena and Kavango) via remittances and the transfer of funds for investment.

The demographics sketched above reflect the high proportion of migrants in Karas in different ways:

- only 60% of people living there were born there;
- a lifetime in-migration of 35%, compared to less than 4% for Namibia;
- a high proportion of the population (63%) are between 15 and 29 years old;
- a large urban population (54% compared to Namibia as a whole (33%), (only the proclaimed urban municipalities are considered urban, all other proclaimed and unproclaimed villages and settlements, including Aussenkehr, are considered rural, thus this statistic is even higher in reality);
- the skewed male-female ratio (53.3%-46.7%) – more men are employed by the mines and fisheries;
- a relatively high labour force participation rate (67% compared to 54% of Namibia as a whole); and
- almost 70% of the population's main source of income is through wages and salaries.

Economic Status

Economic Activity

Entire towns in the Karas Region have been sustained by mining activities, remittances have been generated and distributed to other parts of Namibia, and a significant contribution has been made to the national economy through the payment of royalties and taxes. Diamond mining from Namdeb alone generated 13.4% of the nation's revenues from taxes on income and profits in 2007. (Namdeb, 2007 b). The zinc mine at Rosh Pinah is similarly important, with lesser inputs from fishing, livestock farming, tourism, the port of Lüderitz and services. The long-term nature of the diamond mining activities has resulted in considerable reliance on this industry to drive the economy of this part of Namibia, and indeed has provided a reliable income source to the national treasury over many decades. The zinc mine at Rosh Pinah represents the largest single investment in Namibia since Independence in 1990.

Agriculture has, for some time, been centred largely on small livestock production. The Karakul pelts industry is experiencing a significant come back after a long period of low economic activity while the Ostrich industry is experiencing a decline in production operations. Agricultural processing industries in the Karas Region include the ostrich abattoir near Keetmanshoop, and light industries in Keetmanshoop, Karasburg and Lüderitz.

Crop and irrigated agriculture is the region's new growth industry, with a pest-free climate, good access to water infrastructure encouraging the steady development of farming

enterprises growing crops such as table grapes, dates, fruit, and vegetables. There are irrigation schemes along the Orange and Löwen Rivers, with more schemes being considered at Aussenkehr and at Sendlingsdrift near Rosh Pinah (Karas Regional Council, n.d). The Government of Namibia is considering constructing the Neckertal Dam in the Fish River, between Lüderitz and Keetmanshoop; the aim of which is to provide irrigated land and improved livelihoods in the area.

The main tourist destination of Karas is probably the Fish River Canyon, while the Aus-Lüderitz area is also frequently visited. The historic legacy of diamond mining along the coast, provide for value added to the visitor experience; this opportunity already being utilised with tours being offered to the historical Kolmanskop near Lüderitz. The Sperrgebiet holds more opportunities for tourism development because of its unique and unspoilt landscapes, with great potential for an eco-tourism driven industry. Cross border developments such as the upcoming opening of the Mata Mata border post in the east, and the newly proclaimed /Ai-/Ais Richtersveld Transfrontier Park in the south promise to further encourage regional tourism links.

Livelihoods and Poverty

While the Karas Region has the Nation's second highest level of per capita income (behind the Khomas Region), the percentage of households in severe poverty is near the national average of 21.4%. However, according to the Regional Poverty Profile for Karas (Republic of Namibia, 2007), there are pockets of extreme poverty in the Region, which are hidden by the statistical averages, and the perception of those whom participated in the Participatory Poverty Assessment to compile the Profile are of the opinion that they are getting poorer.

Poverty in the environs of the Project Area occurs in informal settlements around Lüderitz and Rosh Pinah, as well as on commercial farms inland from Lüderitz. The migration workers at Aussenkehr also live under informal settlement conditions. Poverty in the environs of the Project Area is well below the national and regional levels, because of the urbanised nature of the population and the high level of employment amongst households in Lüderitz.

In a recent village-level Participatory Poverty Assessment (PPA) (Republic of Namibia, 2007) conducted in the Karas Region in six poor communities, the priority issues that are linked to poverty were identified as unemployment, alcohol abuse, HIV, water provision and access to local authorities or leaders and governance issues.

The Vision Statement for the Karas Regional Council has a strong focus on poverty reduction.

Lüderitz

The closest settlement to proposed Wind farm project is the coastal town of Lüderitz. The area has been used by the Nama for millenia, while Adolf Lüderitz opened a trading station in 1883 at the site where the Portuguese explorer Dias landed and named it Angra Pequeña in 1488.

Population, Housing and Settlement

The 1342 hectares of land covering the town is divided into three residential areas: Lüderitz Town itself and the two neighbourhoods of Nautilus (medium-density) and Benguela (high-density). Expansion of the town is constrained by the Atlantic Ocean on one side and the Sperrgebiet on all the others. Its environment is harsh, with a hyper-arid climate and a rocky, very sparsely vegetated terrain.

Despite these conditions, the estimated population is estimated to be over 25,000 (Pers Comm Sheefeni, 2010). The unemployment rate was 29% is 2001, but is probably higher now. Figures calculated from the 2001 Census figures show a ration of 116.3 men to 100 women residing there. Previously the work in Lüderitz was mostly carried out by men, but the town now has a more balanced age and gender structure. A large proportion is within the working age-group and the majority (56.4%) are male-headed.

The Karas Regional Poverty Profile (Republic of Namibia, 2007) describes the lives of Lüderitz's poor community. The least affluent suburbs of Lüderitz are situated on mostly rocky terrain.

This, together with a lack of space and harsh weather conditions in the overcrowded informal settlements, makes it hard for people to grow any home produce – their livelihoods depend entirely on cash income. The 2001 National Housing Census (Central Bureau of Statistics, 2004) reveals that 40% of the Lüderitz constituency's' houses are made of corrugated iron sheeting. This corresponds with the current estimate for the informal settlement housing component of 3 000 structures. If one assumes the average household to be 4.1 people (from the 2001 census), then the estimated informal settlement population is 12 300 or just under half the town's population.

Housing demand is greater than supply, with rental and selling prices of houses, flats and erven having increased dramatically over the past few years, making the price of decent accommodation unreachable to those in the lower income brackets (pers comm Mbeeli, 2010). Not surprisingly, housing expansion in low income neighbourhoods is mainly through 'backyard squatting', with consequent densification of poorer neighbourhoods (similar to patterns in the other coastal towns of Swakopmund and Walvis Bay), and squatting on open land (known locally as the Sand Hotel location). This has greatly overtaxed infrastructure, with sewerage reticulation facing particular problems.

Staff at the Lüderitz Town Council nevertheless endeavours to keep pace with the growing housing demand. In 2010, there were vacant erven available in the N$10,000.00 to N$60,000.00 price range. Another 600 ultra low income erven were planned, although administrative approval procedures would hamper the availability of these erven for at least another three years. (Pers Comm Sheefeni, 2010).

People come to this town because of the possibilities of working in the fishing industry, but employment opportunities are limited. The main forms of livelihood are full-time salaried work in the fishing and associated industries, Namdeb, the Town Council, Government, domestic work, small business enterprises, piecework and state pensions. Those without work live on handouts from family and friends, and activities of sex work and drug sales are also reported.

The community perceives the main problems causing poverty in Lüderitz to be unemployment, shortage of housing, voicelessness, bribery and corruption, alcohol and drug abuse, HIV/AIDS and lack of water and electricity provision (National Planning Commission, 2007).

The most common diseases in the Lüderitz area include pneumonia, diarrhoeal diseases, skin diseases, tuberculosis, other respiratory diseases, and ear diseases (SIAPAC, 2001).

Infrastructure

The town is linked by a tar road to Keetmanshoop, 342 kilometres to the east, a railway line to Keetmanshoop (albeit under-utilised), air services, daily passenger service between Lüderitz and Keetmanshoop, local taxies, and harbour sea links with Walvis Bay and ports in South Africa. The Lüderitz airport has a small airport west of the town near Kolmanskop capable of landing small aeroplanes, with a medium-sized asphalt runway and a smaller gravel runway.

Lüderitz is supplied with water from the Koichabpan Water Scheme situated approximately 100 kilometres east of the town. The current demand for water in the town is close to the maximum capacity of the pipeline, therefore the scheme will need to be expanded. Electricity is available through the national grid supplied via a 132kV power line from Keetmanshoop.

Namport is currently considering the expansion of the Lüderitz harbour. This will accommodate increased trade which is expected to boost the importance of the port in the local economy. By 2001, cargo landed at Lüderitz was five times that of 1994, while cargo shipped out of Lüderitz port in 2001 was ten times that of 1994 levels.

Economy

The economy of Lüderitz has historically been dominated by the fishing industry. However, despite shifts in the Total Allowable Catches (TAC) of rock lobsters, landings of rock lobsters have declined over the past fourteen years, due to both anthropogenic impacts as well as natural perturbations. In 2010, the rock lobster industry employed 400-500 people, with seasonal employment of six months per annum being common. Direct beneficiaries can be

estimated at some 3,000-4,000 people, plus local economic activity in Lüderitz itself. Consequently, the industry is in secular decline; insufficient funds are generated by the sector to allow investment in the aging fleet (average age 30 years) or in new equipment. Companies are also no longer expanding to new fishing areas or employing new fishing techniques.

Tourism has increased in importance, but the number of tourist nights still remains low, with most tourists only spending an average of two nights. Prominent hotels and accommodation establishments include the Nest Hotel (145 beds), the Seaview Zum Sperrgebiet, with 43 beds, the Bay View Hotel (56 beds), and Kapps Hotel (44 beds). There is also the Lüderitz Bay Guest House, the Guest House Zum Waterkant, Haus Sandrose and Kratzplatz Accommodation, as well as Shark Island Rest Camp which provides 23 camp sites, each accommodating up to eight people. Occupancy nights at establishments in Lüderitz remain low, at only 37.8% (SIAPAC, 2001). Nevertheless, local economic activity still remains stagnant, and recent commercial initiatives (e.g. the Waterfront) are operating in a challenging environment. Phase 2 of the Waterfront Development, which is intended to give tourists a reason to stay longer and providing small enterprise employment opportunities for local residents, is currently being implemented. This project involves the renovation of the old power station to accommodate holiday apartments, sporting facilities, an aquarium and a maritime museum. The space between the building and the edge of the sea will be upgraded and revitalised to form an important link for pedestrians and tourists between the Nest Hotel and the CBD. Phase 2 of the Waterfront Development will also include a new hotel and holiday apartments and additional office and retail space.

Key tourism points of interest include Diaz Point where a replica of the cross planted by Dias in 1488 has been placed and a lighthouse exists, Sturmvogelbucht where a whaling station was built in 1913/14, the 'Ghost' mining town at Elizabeth Bay and the Bogenfels Arch south of Lüderitz, and Kolmanskop Ghost Town just east of Lüderitz. In addition, the stark scenery surrounding Lüderitz and other places of interest elsewhere in Karas Region (e.g., the wild horses near Aus west of Lüderitz, the Fish River Canyon, etc.) are also common tourist attractions.

Over the years, various investors have intermittently considered the establishment of a wind farm at Lüderitz; the area boasts favourable Aeolian conditions to support the generation of energy from wind. There is currently a high demand for power in Namibia, which if met can assist with other development projects in the country stimulating economic activity. Hence, the proposed Wind farm project.

Socio-economic implications

The table below (

Table 3) summarizes key sensitivities regarding the socio-economic environment with regards to the proposed Wind Farm project:

Table 3: Socio-economic sensitivities

Feature	Sensitivity	Potential Project Impact
Employment	Employment opportunities are limited and highly dependent on the fishing and mining industries.	The wind park will create local jobs during 18-months' construction and 25-years' operations directly, and indirectly through supporting industries and services. The wind park will also provide reliable and affordable electricity for Namibia, providing a broader economic boost and job-stimulus.
Economic contribution	A new project of this magnitude might stimulate economic activities locally and nationally, while contributing to the National GDP.	The project will create local employment, provide affordable power for the economy, and deliver N$ 1.2bn of tax revenue for the GoN.
Livelihood strategies	Job creation can contribute to wages and salaries earned, which is the main source of income for the majority in the Karas region and Lüderitz.	The project will pay a social contribution fee along with the Lease rental which can be used to support projects in the local community. On a macro-level, the project also provides clean power, reducing reliance on fossil fuels, and enhancing life quality.
Housing Pressure	By stimulating economic activities in Lüderitz in terms of electricity supply, while also attracting in-migrants, the number of employees in need of housing is likely to increase, putting pressure on available housing.	The EPC contractor will be required to arrange for temporary accommodation if needed during the construction period. The growth in housing demand will also create a stimulus for building and investment into Lüderitz however.
Conservation and tourism	Infrastructural development such as the wind turbines in the visually/tourism/conservation sensitive areas lowers the value of access corridors and prime areas affected.	The project is expected to have a negligible visual and noise impact, so will not adversely affect tourism. The project is undertaking a conversation programme with the Ministry of Environment and Tourism to support biodiversity, and has altered the project layout to minimize the impact on flora and fauna based on the ESIA findings.

Overall the project can be assessed to have a positive socio-economic impact in terms of job creation, GDP growth, clean power supply, inward foreign investment, and tax receipts for the Government of Namibia.

9.12 Legislative Environment

Legal protection of the study area was a key issue of conducting the EIA and is assumed will form an obstacle during construction and operation. Difficulty in obtaining permits to work in the area was a minor hassle while the effort to obtain permission to remove soil samples was a failure. The restrictions imposed on the proposed Wind Park area may very well become an environmental issue during the construction.

The field team had collected a few discarded bottles in the field, which were promptly impounded by NamDeb security. While this was not intended to test the security system, it raised serious concern regarding the removal of excess building materials, waste and rubbish produced on site, and most importantly, service fluids. When asked, the NamDeb security official said that, in past experience, construction in the area has not been restricted in this regard. Sufficient prior notice will be required for the contractor to depart from the site with equipment or materials.

The restrictions placed on the project by being in the Tsau//Khaeb (Sperrgebiet) National Park will also control activities on site.

The aviation safety regulations also impact on the project area due to its proximity to the Lüderitz Airport. Therefore the site was subjected to an aviation safety assessment (Appendix J). The results of the study show that structures with a total installed height above mean sea level of 300 metres are safe in terms of the assessment. This means that all required WTGs will not breach the safety of the approaches.

Implications of Legislative Environment

The contractor will have to make certain that excess material and, specifically, waste can be removed from the construction site and properly disposed. This will be critical for compliance with The Hazardous Substances Ordinance 14 as well as good environmental practice.

The implementation and monitoring of the EMP is of critical importance and justify a regular audit system as well as having a permanent environmental officer on site during construction and operation of the wind park.

10 Atmosphere and Natural Resources – the Benefits of Green Energy

Environmental benefits of green energy need to be discussed however they do not directly fall into Section 8 "Affected Environment" as the benefits will occur in various parts of the Republic of South Africa rather than in or around the project area. For this reason, this discussion is included separately.

Namibia relies heavily on ESKOM imports, which are mostly comprised of coal-fired electricity. In 1999, 88% of ESKOM energy generated was from coal, 6.5% from Nuclear Energy and the remainder derived from a mix of hydroelectricity and imports. In keeping with the Electricity Act and economic common sense, it is assumed that energy produced by the Wind Park will be used to displace ESKOM imports.

As a hydrocarbon, the main components of coal-combustion emissions are CO, CO_2, SO_x, and NOx. Internationally CO_2 is acknowledged as the leading greenhouse gas contributing to global warming based mainly on the annual abundance of production. SO_2 emitted during combustion is converted by atmospheric moisture into H_2SO_4 (sulphuric acid), which is the primary cause of acid rain. Thus, the promotion of Wind Energy will play a role in reducing both global warming and acid rain.

Coal also generates a significant waste product in the form of ash, a small portion of which is released into the air as fine particulate air-pollution. While the bulk waste ash has some limited reuse, primarily in aggregate mixtures, of the 21.8 metric tons of ash produced by ESKOM in 1999, only 1.11 tons, or 5%, was reused (ESKOM, 2000), the rest being commuted to landfill.

Also of significance is the water consumed to cool the superheated steam in the power facilities. In 1999, ESKOM coal facilities used over 226 billion litres of water, mostly for evaporative cooling. A significant amount of water considering South Africa is frequented by water shortages. Lastly, the conservation of coal is also a valued goal as it is a limited resource

and will continue to play an important role in meeting the world's electricity demands for the foreseeable future.

In consideration of these factors, Table 4 summarises the environmental benefits of Wind Power. Assuming the Park is built to capacity of 44MW, and generates +-190,000MWh per annum (DECON), at 88% coal contribution, excluding 11% transmission losses between South Africa and Namibia, the Park will displace 167,200MWh per annum of ESKOM's coal-fired energy production.

Table 4: Wind Power benefit comparison.

	Resources Saved by Lüderitz Wind Park Per year	Pollution Avoided by Lüderitz Wind Park Per year
Water	84.94 million litres	-
Coal	33.98 million kg	-
Total Ash	-	18.46 million kg
Ash Emitted into Atmosphere	-	51,120 kg
SO_x Emissions	-	0.82 million kg
NO_x Emissions	-	0.40 million kg
CO_2 Emissions	-	148 million kg

Environmental Benefits Provided by a 44MW Wind Energy Facility in Lüderitz over Coal Energy. **Based on 167,200 MWh per annum of energy produced by Wind Park directly offsetting imports of coal-fired power from ESKOM.** ***Emission and consumption figures from ESKOM 1999 Environmental Report.***

These are inarguable environmental benefits that form the primary motivation behind development of any wind park and are the greatest benefits one purchases with the elevated capital investment required. According to Manfred Manchen, principle technologist of NamPower System Planning Department, losses on the ESKOM transmissions are around 10% after recent improvements. Consequently, the values listed in Table 1 are actually 11% greater (i.e. 11.1MW must be generated by ESKOM for every 10MW that reaches and is used in Namibia).

Some attempts to discredit the atmospheric benefit of wind energy were found. The claim that total production load of greenhouse gasses during construction and manufacturing of the Wind Park building materials, the operation and maintenance of a Wind Park, when normalised by total-life electricity production is greater than hydrocarbon-fired steam power. These arguments were, however, entirely unquantified and speculative; the concept has been included here only for sake of completeness.

The Diaz wind park site is particularly beneficial therefore from a fossil-fuel displacement perspective therefore given its very high wind yield and plant capacity factor; the plant is expected to produce at a capacity factor in excess of 50%, far higher than typical wind parks, making the chosen site very suitable.

11 Project Alternatives in the Environmental Balance

A discussion of project alternatives is an essential component of an EA to determine if another project could meet the goals of the project under study with a reduced environmental impact. Fundamentally, wind energy is pro-environment, it's trade-off being inflated cost, and the subject of cost as an environmental factor is the discussion topic of many university lecture halls. Thus, this section weighs economics on environmental impact in the consideration of alternatives.

To further complicate the definition of an "alternative" is the nature of wind energy. Wind energy can only be used when sufficient wind is available which is for the most part unpredictable. Thus, wind energy is used to displace import or fossil energy when it is available. Some energy production methods discussed in this section, such as Kudu natural gas, are not comparable alternatives to wind in that they utilise reservoirs of stored fuel that can be turned on and off on command. This arguably decreases the overall value of wind energy but for sake of this discussion will be disregarded.

Environmental

As previously mentioned a preliminary EIA was conducted in the Pre-Feasibility Study, only environmentally sound locations were selected for analysis of Wind Energy potential. Of these sites, Grosse Buchte has the highest generation potential, which is more than double the next two sites' potential. This EIA was commissioned for a potential maximum build out of 20MW, thus alternative sites for this study are not considered, as they are incomparable.

The key acknowledged concerns of Wind Parks identified during literature and Internet studies are noise, avifauna, soil-erosion, and visual impact. From the findings of literature, fieldwork and remote sensing, all of these factors, as well as other environmental issues investigated, are minimal at the study area. Thus, the original research team concluded that this is a pro-environment project sited in an ideal location for minimised environmental impact.

Economic

A detailed economic review of viable generation alternatives is discussed in the Feasibility Study. Two pieces of legislation govern electricity generation in Namibia, namely the Electricity Act and the White Paper on Energy policy; their inclusion here as criterion for considering alternatives is a must. In brief summary, the White Paper on Energy policy calls for expanded diversification and self-sufficiency of electricity generation, specifically calling for 100% of peak demands and 75% of total demand produced within Namibian borders by 2010. The Electricity Act regulates the cost of electricity production in order to protect the Namibian consumer. The options considered in the Feasibility Study, as well as two unstudied alternatives, energy conservation and decentralised wind and solar energy, are included below in Table 3.

Table 5: Review of New Power Generation Options Available to NamPower and Their Applicability to Electricity and White Paper on Energy Policy

Option	Meets Electricity Act?	Meets White Paper on Energy Policy?
Increase **Eskom** Imports	**Yes**	**No**
Epupa	**Maybe** Will have phenomenal capital cost - may be hard to find grants – may put burden on ratepayer. Hydrologic viability still under contention - cost analysis of feasibility has been questioned.	**Maybe** Does not diversify electricity production – While Namibia has 50% right to Kunene River water its unclear whether this is technically an "internal resource"
Van Eck	**Maybe** Depending on coal costs and NAD / USD fluctuations	**No** relies on imported fuels - no diversification
Kudu	**Yes**	**Yes**
Wind Park	**Maybe** The final tariff awarded to the Diaz wind park is considerably reduced versus original expectations, making this a cost-effective power option for NamPower (cheaper than fossil fuel domestic generation and many power import contracts)	**Yes**
Decentralised wind and Solar (DWS)	**Yes**	**Yes**
Conservation – Energy Management (EM)	**Yes** if properly managed, will fund itself with spared capital investment dividends and revenues from penalty billing	**Yes** marginal decrease in net-demand reduces external dependence - thereby increasing percent self-sufficiency

A contradiction/conflict between the two Acts is introduced with a review of the energy resources and alternatives available inside Namibian Borders. With the exception of the Kudu gas fields, Namibia is not known to have any fossil fuels. This leaves Epupa (questionably an internal source as upstream management is out of local control) as the only proven cost-effective power generation alternative left to NamPower. Wind and solar development are costly in comparison and will require flexibility in the Electricity Act.

Kudu is the only clear centralised electricity generation alternative to the Wind Park. It is also clear that if Kudu does not prove effective, something will have to give between the Electricity and White Paper on Energy policy. Kudu is incomparable to the Wind Park from an environmental standpoint, however. Kudu would require a 750MW-powerstation and

numerous production wells, plus a number of high-tension powerlines. The disrupted environment would be in the vicinity of the Orange River mouth, which has higher environmental conservation value than the area for the proposed Wind Park. And of course while a clean burning fuel, superior to coal, oil and diesel, natural gas combustion produces CO_2 (a greenhouse gas) and is a finite resource.

Two additional alternatives are included in the table that the EIA team found lacking in the Feasibility Study but should be included as a point of international Best Management Practice (BMP) and environmental interest. They are discussed below

Energy Management (EM)

An internationally recognised, cost-effective and feasible alternative to increasing supply of energy is reducing consumption through energy management (EM). Energy consumption is known to be a factor of public awareness, electrical efficiency, and cost to the consumer amongst other things. Thus consumption can be reduced through informed adjustment of these factors. (This requires end-use analysis that indicates what the electricity sold to customers is actually used for, i.e. 60% of total energy is used by residential customers, of which 40% is used for water heaters, 20% for lighting, etc.)

This is the premise of EM. Through EM, an energy provider uses financial resources available for development in a new energy supply and invests it into energy management programs that will result in a comparable reduction of consumption. Some examples of EM investment include:

- Subsidising replacement of inefficient water heaters and air conditioners (AC)
- Subsidising thermal insulation, double glaze windows, to improve efficiency of AC and heating systems
- Better structured tiered-billing rates (also known as penalty-billing for excessive electricity consumption)
- Subsidising the purchase of all renewal technologies for home use (i.e. solar panels, solar water heaters, wind generators)
- Legislation: for example, penalise businesses for using AC without self-closing or automatic doors; ban open-top freezers in super-markets, etc
- Public awareness campaigns (though not as reliable as the above methods)

According to NamPower Senior General Manager, Mr. Imker Hoogenhout, NamPower has never conducted any electricity consumption analysis for the purpose of EM. To date only the Windhoek Municipality has practised some unstructured EM through offering financial incentives. Without data or research it is difficult to say what the potential for reduced consumption is but, given the minimal effort made to date, it is a foregone conclusion that significant reductions can be made. For US$20.6 million ('99 dollars) (DECON), the expanded Wind Park aims to produce roughly 6% of Namibia's 1999/2000 total demand of 313MW (NamPower, 2000). Where the same budget for the Wind Park invested into subsidising energy-efficient appliances for Namibian citizens and other conservation measure, it is conceivable that a 6% reduction could be achieved, possibly for less money.

EM has the highest environmental benefit as it maximises efficiency of existing production methods, thereby minimising their environmental impacts. EM can also be an effective method of reducing peak-demands, another costly factor of energy production. A well-structured EM program that includes restructured billing and penalties can provide a firm reduction in net energy demand without sacrificing revenues for the supplier.

The negative impact of EM is known as "demand hardening". When efficiency of use is significantly increased, consumers are less capable of reducing energy consumption should it be necessary, thus the demand is said to be hardened. Demand hardening is only an issue in times of energy shortages or an energy crisis resulting from fuel shortages or fuel transport problems. It should be noted that wind energy would form a buffer against a fuel crisis and, therefore, demand hardening were EM to be implemented.

Decentralised Wind and Solar Energy (DWS)

In many ways DWS is an extension of EM. The principle of DWS is that individuals own and operate private wind and solar energy systems to supply their own needs. The individuals are also connected to the main grid to meet their needs during low production periods. When excess energy is produced locally (energy in excess of personal consumption and local battery storage), it is fed back into the main supply grid for some marginal monetary compensation from NamPower. NamPower (or the local retailer i.e. Windhoek Municipality) would have to form incentives such as soft loans for private purchase and installation.

DWS is actively used (on a small-scale) in Europe and the United States. Dr. Marshal Merriam of the University of California, Berkeley points to the following benefits of DWS:

- Large reduction in total demand on the main grid
- Provides small-scale additional electricity generation
- No new or additional infrastructure required
- No operation and maintenance expenses
- Reduced transmission and distribution costs
- Increased system stability and protection from blackouts

DWS is of very-high environmental value as it is renewable energy and does not disrupt any new environment through construction of transmission lines or power stations.

The negative implication of DWS for NamPower is loss of revenues, which is unsustainable. NamPower could investigate options such as owning and leasing the installations to private parties thereby recovering costs and maintaining a positive cash flow.

No project alternative

If the project is not to be continued the following positive scenario can be presented:

- Tsau//Khaeb (Sperrgebiet) National Park with it's IUCN Category II status will be retain it's status quo.
- Two critical habitats namely the Lüderitz Peninsula Dwarf Shrubland and the Lüderitz Plains Dwarf Shrubland will remain unchanged.
- The project biological environment will continue its status in terms of vegetation, bird movement, Brown Hyena movement and territoriality.
- The physical environment such as archaeology and erosion will remain stable under the conditions of change already experienced.
- There will be no noise and visual impact (though this is negligible for this project anyway).
- The Tsau//Khaeb (Sperrgebiet) National Park will achieve its objective to protect and manage the area in the context of conservation.

However the following negative scenario will also present itself

- The economic benefit to the town of Lüderitz will not be realised.
- The deficit of electricity supply in the Karas Region and Namibia will continue and increase.
- The implementation of sustainable wind energy will remain untried in Namibia.
- The opportunities of skill transfer to labour in the region will not be realised.
- Choosing a different site would likely reduce the energy yield since the selected location is particularly suitable for wind power generation, meaning displacement of fossil-fuel generation will be lower.

12 Impact Assessment

Methodology employed for the impact assessment

Each of the potential impacts identified can be screened according to the set of questions below (Figure 2). The list of impacts further discussed in this Section all resort under the "YES" answer, namely those which fall within the scope of the development and the responsibility of the client. No issues falling outside the scope of this development were identified during the process and the information available was deemed sufficient to make an assessment and recommendations.

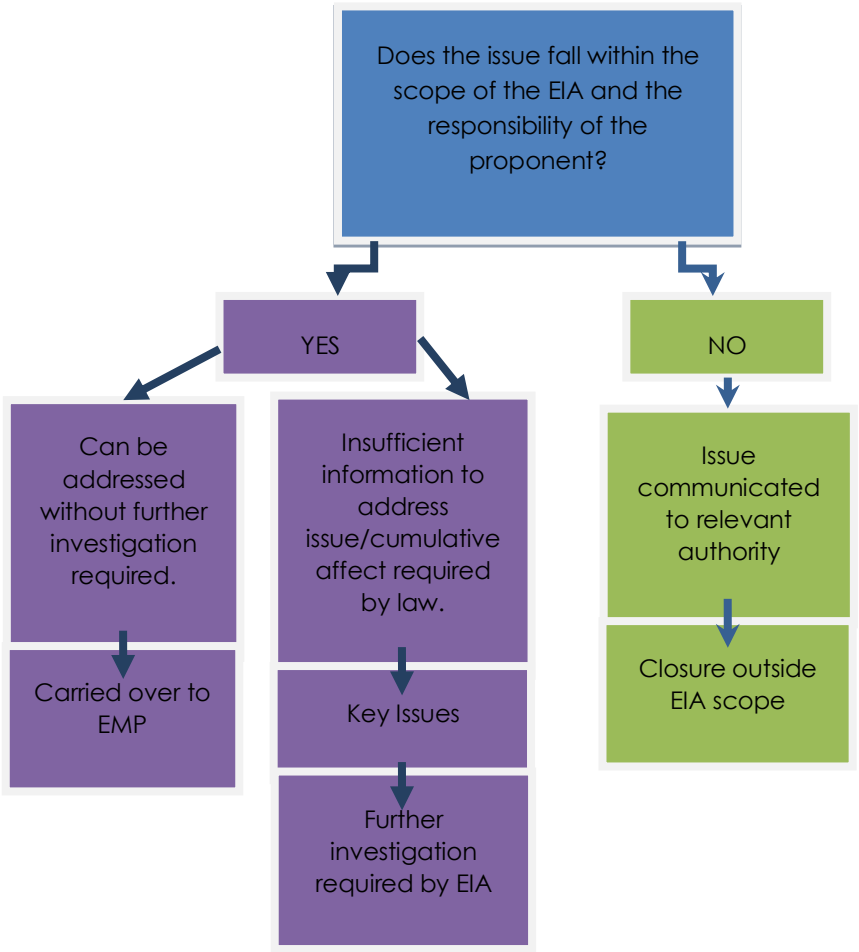


Figure 2: Screening process to determine key issues

To fully understand the significance of each of the potential impacts, it is necessary to break each impact down into various categories. The definitions of each of the criteria are contained in **Table 6.**

Table 6: Definitions of each of the Criteria used to determine the significance of impacts

	DESCRIPTION
Nature	Reviews the type of effect that the proposed activity will have on the relevant component of the environment and includes "what will be affected and how?"
Extent	Geographic area. Indicates whether the impact will be within a limited area (on site where construction is to take place); local (limited to within 15km of the area); regional (limited to ~100km radius); national (limited to the coastline of Namibia); or international (extending beyond Namibia's boarders).
Duration	Whether the impact will be temporary (during construction only), short term (1-5 years), medium term (5-10 years), long term (longer than 10 years, but will cease after operation) or permanent.
Intensity	Establishes whether the magnitude of the impact is destructive or innocuous and whether or not it exceeds set standards, and is described as none (no impact); low (where natural/ social environmental functions and processes are negligibly affected); medium (where the environment continues to function but in a noticeably modified manner); or high (where environmental functions and processes are altered such that they temporarily or permanently cease and/or exceed legal standards/requirements).
Probability	Considers the likelihood of the impact occurring and is described as uncertain, improbable (low likelihood), probable (distinct possibility), highly probable (most likely) or definite (impact will occur regardless of prevention measures).
Significance	Significance is given before and after mitigation. Low if the impact will not have an influence on the decision or require to be significantly accommodated in the project design, Medium if the impact could have an influence on the environment which will require modification of the project design or alternative mitigation (the route can be used, but with deviations or mitigation) High where it could have a "no-go" implication regardless of any possible mitigation (an alternative route should be used).
Status of the impact	A statement of whether the impact is positive (a benefit), negative (a cost), or neutral. Indicate in each case who is likely to benefit and who is likely to bear the costs of each impact.
Degree of Confidence in Predictions	Is based on the availability of specialist knowledge and other information.

The application of the above criteria to determine the significance of potential impacts uses a balanced combination of duration, extent, and intensity/magnitude, modified by probability, cumulative effects, and confidence. Significance is described as follows:

Table 7: Definitions of the various significance ratings

SIGNIFICANCE RATING	CRITERIA
Low	Where the impact will have a negligible influence on the environment and no modifications or mitigations are necessary for the given development description. This would be allocated to impacts of any severity/ magnitude, if at a local scale/ extent and of temporary duration/time.
Medium	Where the impact could have an influence on the environment, which will require modification of the development design and/or alternative mitigation. This would be allocated to impacts of moderate severity/magnitude, locally to regionally, and in the short term.
High	Where the impact could have a significant influence on the environment and, in the event of a negative impact the activity(ies) causing it, should not be permitted (i.e. there could be a 'no-go' implication for the development, regardless of any possible mitigation). This would be allocated to impacts of high magnitude, locally for longer than a month, and/or of high magnitude regionally and beyond.

1.1. Assessment of impacts

By subjecting each of the potential impacts to the criteria stipulated above, it is possible to establish the significance of each impact prior to implementing mitigation measures and then after mitigation measures have been implemented. Some of the mitigation measures are mentioned but detailed descriptions of management actions are contained in the accompanying ESMP.

The process of assessing the significance of each of the possible impacts is contained in Table 8.

As can be seen from the tables, the project is expected to have a low overall impact.

Table 8: Impact assessment of the proposed project

IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE EMP)	POST-MITIGATION
CONSTRUCTION PHASE									
Physical disturbance of soil during transport and construction activities	Negative Loose soils leads to erosion	Local	Short	Medium	Definite	High	Medium	*Restrict construction activities to defined areas.* *Excavated material must be covered in stockpiles until reuse.*	Low
	Negative Proliferation of tracks.	Local	Medium	Medium	Probable	High	Medium	*Restrict movement to defined areas. Use existing roads until access require limited new roads.*	Low
Shallow Gneiss will hamper foundation construction	Negative Excessive excavation methods required such as blasting and large excavators	Local	Permanent	Medium	Definite	High	Medium	*Use surface anchored foundations with very limited rock breaking.*	Low
Sand inlays will act as traps for contaminants	Any contaminant fluids will not drain away but accumulate in the contained sand hollows	Local	Short	Medium	Probable	High	Low	*Prevent spilling and leaving fluids unattended.* *Manage the use of hazardous fluids by means of*	Low

IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE EMP)	POST-MITIGATION
								the EMP eg how to clean up spills.	
Physical destruction of vegetation by construction activities and new roads	Including species of conservation concern during construction	local	Long Term	High	Definite	High	High	*Limit activity footprint and limit movement to designated areas only.* *Implement and monitor the Vegetation Management Plan*	Medium / Low
Reduction of two critical habitats	Reduction of a critical habitat in the Lüderitz Plains (0.06km^2) and Lüderitz Peninsula (0.04km^2) dwarf-shrublands by 0.1km^2.	local	Long term	Low	High	High	Medium / High	*Limit activity footprint and limit movement to designated areas only.* *Implement and monitor the Vegetation Management Plan*	Medium / Low
Disturbance and killing of reptiles by activities	Reptiles are very locality bound and will be encountered	Local	Short	Low/none	Highly probable	medium	Low	*Remove especially Namaqua Cammelion if encountered* *Killing of reptiles is forbidden and should be penalized*	Low
Disturbance through noise,	Negative effect on birds using flight	Internatio nal	Temporar y	Medium	Highly Probable	Low to Medium	High	*Incorporating recommended no-go zone*	Low

IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE EMP)	POST-MITIGATION
movement and temporary occupation of an otherwise undisturbed habitat	corridors, resulting in additional energy costs to migrating birds, forced to alter their flyways							*into final design of individual turbine placement* *Keeping construction time as short as possible*	
Habitat loss, including foraging, roosting and breeding habitat of the area occupied by the completed structure	Negative effect, particularly on resident breeding birds (potential permanent displacement)	Site specific	Permanent	Medium	Probable	High	Medium	*Incorporating recommended no-go and sensitive zones into final design of individual turbine placement* *Reducing the final extent of developed area to a minimum*	Low
Construction of turbine towers and access roads	Disturbance of brown hyenas	local	Medium term	Medium	Definite	High	Medium	*Incorporating recommended no-go and sensitive zones into final design of individual turbine placement* *Camera trap monitoring*	Medium / low

IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE EMP)	POST-MITIGATION
Construction of turbine towers and access roads	Effects of construction operations on territory boundary north and east of the proposed wind farm area (habitat fragmentation)	Regional	Medium term	Medium	Highly probable	High	High	*Incorporating recommended no-go and sensitive zones into final design of individual turbine placement* *Camera trap monitoring to use as ID catalogue of resident hyenas*	Medium / low
Construction of turbine towers and access roads	Effects of construction operations on denning behaviour (disturbance)	Regional	Medium term	Medium/high	Highly probable	High	High	*Incorporating recommended no-go and sensitive zones into final design of individual turbine placement* *Camera trap monitoring to use as ID catalogue of resident hyenas*	Medium
New roads and power lines	Disturbance and/or mortality of brown hyenas through increased traffic	Regional	Medium term	High	Probable	High	High	*Enforcement of a strict speed limit.* *Awareness raising with drivers.* *Limit traffic to daylight hours.*	Low

IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE EMP)	POST-MITIGATION
Archaeological Landscape	Visual degradation	Local	Long	Medium	Improbable	High	Medium	*Demarcate, protect and avoid development near sites.* *If removal is inevitable, apply at Heritage Council via an archaeologist*	Low
Archaeological Landscape	Visual degradation	Local	Long	Medium	Improbable	High	Medium	*Demarcate, protect and avoid development near sites.* *If removal is inevitable, apply at Heritage Council via an archaeologist*	Low
Intrusion in a visual sensitive landscape.	Visual sense of place	Local	Long	Low	Definite	Low	Low	*Break the spatial dominance of the structure by using various shades of a low tone colour such as grey in bands on the structure to break the visual texture. This will also lower the relative size perceived, the visibility distance, and the scale contrast.*	Low

IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE EMP)	POST-MITIGATION
								Use photography from viewpoints 4 and 7 to optimise the positioning of the various shading on the structure.	
Management Plan of the Tsau//Khaeb (Sperrgebiet) National Park	Conflict with the conservation objectives of the Management Plan	Local	Long term	Medium	Probable	High	Medium	*Include the Management Plan in the Environmental Management Plan, by giving conservation initiatives preference.*	Low
OPERATIONAL PHASE									
Physical disturbance of soil during maintenance transport	Negative Proliferation of tracks.	Local	Medium	Medium	Probable	High	Medium	*Restrict movement to defined areas.* *Use only existing roads.*	Low
Erosion of structures	Deterioration of structure and parts of the WTGs by windblown sand and corrosion	Local	Long Term	Medium	Highly probable	High	Medium	*Construction material should be corrosion and friction resistant*	Low

IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE EMP)	POST-MITIGATION
Sand inlays will act as traps for contaminants	Any contaminant fluids will not drain away but accumulate in the contained sand hollows	Local	Short	Medium	Probable	High	Low	*Prevent spilling and leaving fluids unattended.* *Manage the use of hazardous fluids by means of the EMP eg how to clean up spills.*	Low
Physical destruction of vegetation by construction activities and new roads	including species of conservation concern during construction	local	Long Term	High	Definite	High	High	*Limit activity footprint and limit movement to designated areas only.* *Implement and monitor the Vegetation Management Plan*	Medium / low
Disturbance and killing of reptiles by activities	Reptiles are very locality bound and will be encountered	Local	Short	Low/none	Highly probable	medium	Low	*Remove especially Namaqua Cammelion if encountered* *Killing of reptiles is forbidden and should be penalized*	Low
Bird Mortality	Collision of priority species, including globally threatened birds and/or migrating	Internatio nal	Long term	Medium to high	Highly probable	High	High	*Incorporating recommended no-go and sensitive zones into final*	Low

IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE EMP)	POST-MITIGATION
	birds with wind turbine blades							*design of individual turbine placement* *Reducing the final extent of developed area to a minimum* *Apply IFC EHS wind energy guidelines section 33 which include:* *Turbine size/number optimization.* *Curtailment/shut-down management* *Using bird-friendly turbine lighting* *Eliminating or minimizing additional light sources, e.g. at site substation* *Eliminate free-wheeling* *Eliminate artificially creating food sources* *Burying cabling between each turbine and the site*	

IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE EMP)	POST-MITIGATION
								substation to eliminate cumulative collision impacts	
Disturbance through noise, movement and temporary occupation of an otherwise undisturbed habitat	Negative effect on birds using flight corridors, resulting in additional energy costs to migrating birds, forced to alter their flyways	International	Temporary	Medium	Highly Probable	Low to Medium	High	*Incorporating recommended no-go zone into final design of individual turbine placement* *Keeping construction time as short as possible*	Low
Habitat loss, including foraging, roosting and breeding habitat of the area occupied by the completed structure	Negative effect, particularly on resident breeding birds (potential permanent displacement)	Site specific	Permanent	Medium	Probable	High	Medium	*Incorporating recommended no-go and sensitive zones into final design of individual turbine placement* *Reducing the final extent of developed area to a minimum*	Low
Maintenance of turbine	Disturbance of brown hyenas	local	Medium term	Medium	Definite	High	Medium	*Incorporating recommended no-go and*	Medium / low

IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE EMP)	POST-MITIGATION
towers and access roads								*sensitive zones into final maintenance planning* *Camera trap monitoring*	
Maintenance of turbine towers and access roads	Effects of maintenance operations on territory boundary north and east of the proposed wind farm area (habitat fragmentation)	Regional	Medium term	Medium	Highly probable	High	High	*Incorporating recommended no-go and sensitive zones into final maintenance planning* *Camera trap monitoring* *ID catalogue of resident hyenas*	Medium / low
Maintenance of turbine towers and access roads	Effects of maintenance operations on denning behaviour (disturbance)	Regional	Medium term	Medium/high	Highly probable	High	High	*Incorporating recommended no-go and sensitive zones into final maintenance planning* *Camera trap monitoring* *ID catalogue of resident hyenas*	Medium
Roads and power line maintenance	Disturbance and/or mortality of brown hyenas through increased traffic	Regional	Medium term	High	Probable	High	High	*Enforcement of a strict speed limit.*	Low

IMPACT	STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE EMP)	POST-MITIGATION
								Awareness raising with drivers. *Limit traffic to daylight hours.*	
Archaeological Landscape	Visual degradation	Local	Long	Medium	Improbable	High	Medium	*Demarcate, protect and avoid development near sites.*	Low
Management Plan of the Tsau//Khaeb (Sperrgebiet) National Park	Conflict with the conservation objectives of the Management Plan	Local	Long term	Medium	Probable	High	Medium	*Include the Management Plan in the Environmental Management Plan, by giving conservation initiatives preference.*	Low

Cumulative Impacts review

The accumulation of impacts from the project specifically centres around the impacts expected on birds, the Brown Hyena, and vegetation in the Lüderitz Peninsula Scrubland zone.

It is clear from the sensitivity maps of these aspects that the entire site shows various levels of sensitivity. However the cumulative effects are clearly concentrating in the north-western extension of the project site.

The only means by which the cumulative impacts can be managed is by avoidance.

The sensitivity of the entire site necessitates direct intervention in the control of access of the site for the various activities that will take place during planning, construction, and operations.

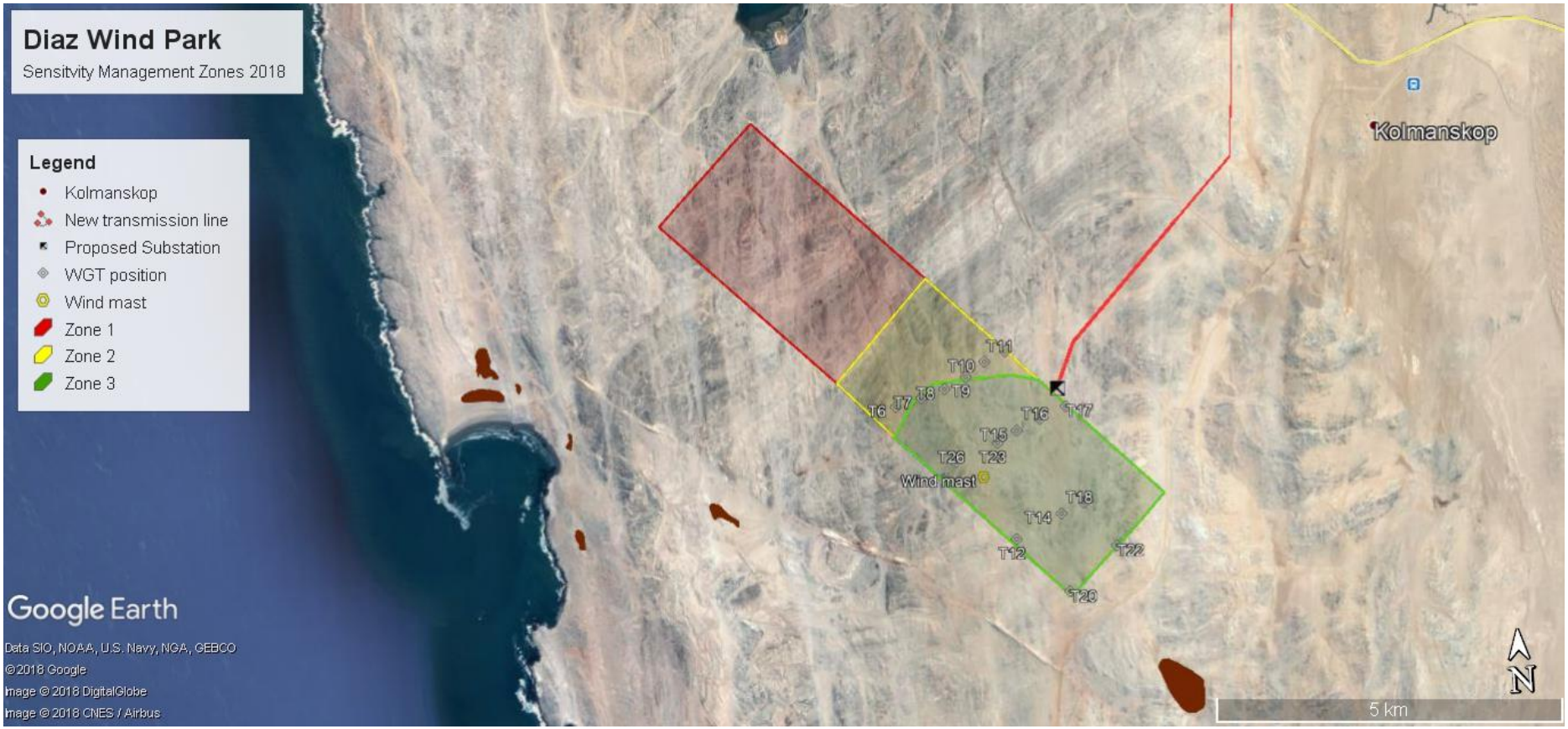
The access management intervention can be classified as follows:

Table 9: Environmental Management Intervention Zones

Access Zone	Environmental Management Intervention	Boundary Positions
Zone 1	**No-go Zone:** The area is not accessible for any personnel or outsides under any circumstance. No roads and activities are allowed in this zone. No WGTs will be allowed in Zone 1. **No WTGs are planned for this zone in the plant layout**	26 43' 57.792" S; 15 9' 07.560" E 26 43' 11.676" S; 15 9' 57.456" E 26 41' 53.475" S; 15 8' 31.650" E 26 42' 39.001" S; 15 7' 40.023" E
Zone 2	**Vegetation Protection Zone:** Very limited access is allowed only for authorized personnel (approved daily in writing) and no access for outsiders. Access will be authorized by request only on a daily basis, under the control of the Site Environment Officer. This zone may only accommodate minimum new roads, internal power lines and demarcated WTG work space. Clearing of any vegetation will only be allowed during construction under the control of the Vegetation Management Plan.	26 44' 2.253" S; 15 10' 52.517" E 26 44' 00.842" S; 15 9' 57.962" E 26 44' 24.746" S, 15 9' 35.688" E 26 43' 57.792" S; 15 9' 07.560" E 26 43' 11.676" S; 15 9' 57.456" E
Zone 3	Limited Access Zone: Free access is allowed to all personnel only on existing roads and demarcated WTG work space. This zone may accommodate support infrastructure such as the substation, and office/storage facility. Clearing of any vegetation will only be allowed during construction under the control of the Vegetation Management Plan.	26 45' 44.449" S; 15 11' 2.869" E 26 44' 58.929" S; 15 11' 54.513" E 26 44' 02.253" S; 15 10' 52.517" E 26 44' 00.842" S; 15 09' 57.962" E 26 44' 24.746" S; 15 09' 35.688" E

Map 9 shows the position of each Environmental Management Intervention Zone. The use of Zone 1 is not allowed and no WTGs are located in this zone, mitigating the potential disturbance caused to the most sensitive part of the site.

The position in a National Park, sensitivity of the site and the required management system for both the Vegetation Management Plan and the Environmental Management Intervention Zones necessitates that the client appoint a person on site that will fulfil the role of ***Site Environment Officer*** either on a permanent basis of as a function to one of the site personnel.



Map 9: Site access management zones

As shown in Map 10, no WTGs are in Zone 1 (most sensitive zone), and the majority are in Zone 3 (least sensitive zone).

13 Recommendations

Relevance of the project area

It is clear from the EIA report that the project site is of significant environmental value, especially the extended area to the North West. This is established through the various specialist studies as well as the inclusion of the area in the Tsau//Khaeb (Sperrgebiet) National Park and it's IUCN Category II Status.

The project may contribute to the reduction of a critical habitat in the Lüderitz Plains (0.06km2) and Lüderitz Peninsula (0.04km2) dwarf-shrubland by 0.1km2. This contribution is considered small in scale and therefore not detrimental to the habitat.

The North Western section of the project area is of particular conservation importance and should not be considered for any form of development. This area has been excluded from the project layout, with all WTGs located in less sensitive zones.

The reasons for these are:

- It's allocation as a conservation area in the Tsau//Khaeb (Sperrgebiet) National Park management plan.
- The occurrence of significant Brown Hyena activity.
- The recognised avian flight corridor of local and regional significance.
- The very limited Lüderitz Peninsula Scrubland occurring in this section of the site.

The cumulative impacts described in the North Western section cannot be justified in terms of the benefits of the project and, seen in the light that this area was not part of the original project, should be considered as a no-go area. Neither is off-set in terms of the above mentioned sensitivities appropriate or practical.

There is however also enough justification if a wind park is developed in the original site.

With careful consideration and planning of environmental management principles the development proposed can be optimised to become a sustainable project.

Environmental management requirements

In order to assure that the project is sustainable and environmentally beneficial the following requirements will have to be satisfied:

<u>Adhering to the existing conservation framework.</u>

The project must be developed and regulated in the context of the Tsau//Khaeb (Sperrgebiet) National Park Management Plan and park regulations.

All activities of the development should be managed within the boundaries and requirements set in the Tsau//Khaeb (Sperrgebiet) National Park Management Plan, which will take precedence over all other environmental and other management requirements.

The project planning, implementation and operation should be done in consultation with and approval of the relevant assigned representatives of the Directorate of Parks of the Ministry of Environment and Tourism.

Critical Habitat management should adhere as far as possible to the IFC PS6.17 requirements by:

- Using existing tracks before developing new tracks.
- Keep internal transmission lines immediately beside tracks.

- Micro-siting tracks and turbine platforms in line with vegetation sensitivity and according to the Vegetation Management Plan.
- Limiting the potential impact to up to 30% of 0.09m^2.
- Applying the Diaz Wind Park Vegetation Management Plan as the required Biodiversity Action Plan. This includes an initiative proposed by the Ministry of Environment and Tourism during the March 2018 site visit to make available dedicated sites for critical vegetation relocation in the Lüderitz Peninsula Dwarf Shrubland. The proponent will provide funding for the planning. Relocation training, nursery development, relocation and long term management of the relocation sites.

Implementation and monitoring of the entire Environmental Management Plan

The environmental management plan must be applied as a contractual agreement between the developer and the Ministry of Environment and Tourism. Strict adherence to the EMP is essential in view of the conservation framework which the project is executed in. The EMP will incorporate the following essential components:

- The recommended mitigation measures as listed in the Impact Assessment.
- The Vegetation Management Plan and its requirements.
- The Environmental Management Intervention Zones and its constraints.
- The long term avian and Brown Hyena monitoring requirements as set out in the EMP. This includes the longitudinal avifaunal impact study currently being undertaken.

Compliance with such measures is also to be included in the Lease Agreement between Diaz and the Ministry of Environment and Tourism, thereby further reinforcing the obligations of care upon the project.

Management and auditing capacity requirements.

In order to be able to adhere to the above mentioned requirements the following capacity and system must be put into place:

- Appoint a Site Environment Officer to coordinate and monitor the adherence to the Tsau//Khaeb (Sperrgebiet) National Park Management Plan and the Environmental Management Plan, as well as the external environmental audit process. This position will be:
    - Either a full time appointment, especially during construction, or assigned as a role to a permanent site employee.
    - Responsible for the coordination of and liaison with the MET work group.
    - Responsible for the management of access requirements of the various Environmental Management Intervention Zones.
    - Responsible for the coordination of the long term avian and Brown Hyena monitoring requirements.
    - Responsible for the coordination of the Vegetation Management Plan
    - Responsible for the implementation of the EMP in the SNPMP framework.
    - Responsible for the coordination and reporting of the external environmental audit system.
- Establish a working group with the relevant stakeholders in the Ministry of Environment and Tourism which will actively review and approve project activities in terms of adherence of the Tsau//Khaeb (Sperrgebiet) National Park Management Plan and the Environmental Management Plan, as well as the external environmental audits.

- Implement an external environmental audit system on a quarterly basis during construction and on an annual basis during the operation of the Wind Park. This must be used to verify the effectiveness of the EPM and implement adjustments if required.

Recommendation of the Environmental Impact Assessment

It is hereby recommended that the project ***be approved for Environmental Clearance*** subject to the following conditions:

- The recommendations are incorporated in the Environmental Management Plan.
- The project proponent sign an Environmental Contract based on the recommendations and the Environmental Management Plan with the Ministry of Environment and Tourism.
- The regular external environmental audits be submitted to the Ministry of Environment and Tourism for continued endorsement of the Environmental Clearance.

NOTE TO READER:

During the EIA process the client was made aware that the north-western section of the site is very sensitive with potential cumulative impact that must be considered as a No-Go Zone (see Chapter 12 and Map 9). The client adjusted the WTG layout to avoid this No-Go Zone.

Therefore all maps in the EIA and EMP Reports shows the final layout after adjustment.

14 Definitions of technical terms and abbreviations

BMP	Best management Practice
DEA	Directorate of Environmental Affairs
DWS	Decentralised wind and solar energy generation
EIA	Environmental Impact Assessment
EDM	Electricity demand management
EMP	Environmental Management Plan
GIS	Geographical information system
GPS	Global positioning system
IAP	Interested and affected party/person
IFC	International Finance Corporation
kV	Kilo Volt
kV rms	Kilo Volt root mean square
MET	Ministry of Environment and Tourism
MME	Ministry of Mines and Energy
MW	Megawatt
SNPMP	Tsau//Khaeb (Sperrgebiet) National Park Management Plan
UTM	Universal Transverse Mercator
WTG	Wind Turbine Generator

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