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KARREEBOSCH 132kV POWERLINE AND SUBSTATION TRANSPORT IMPACT ASSESSMENT

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REVISION 5

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SYNOPSIS

Preparation of a Traffic Impact Assessment for the proposed Karreebosch 132kV powerline to be established for the Karreebosch Wind Energy Facility. The site is located approximately 35 km north of Matjiesfontein and extends across two provinces, namely the Northern and Western Cape Provinces. This assessment pertains to all relevant traffic and transportation engineering aspects of the facility.

KEY WORDS:

Wind Energy Facility, WEF, Transport Impact Assessment, 132kV Powerline

QUALITY VERIFICATION

This report has been prepared under the controls established by a quality management system that meets the requirements of ISO 9001: 2015 which has been independently certified by DEKRA Certification.

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KARREEBOSCH 132kV POWERLINE AND SUBSTATION TRANSPORT IMPACT ASSESSMENT

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1 INTRODUCTION & SCOPE OF WORK

1.1 Introduction

WSP appointed JG Afrika Pty (Ltd) to provide transport impact input for developing the Karreebosch 132kV overhead power line, 33/132 KV substation and associated infrastructure. The powerline is required to evacuate the power generated by the proposed Karreebosch Wind Energy Facility (WEF).

1.1.1 Permitting process

The entire extent of the proposed 132kV Karreebosch Overhead Powerline (OHPL), 33/132kV Substation and associated infrastructure is located within one (1) of the Strategic Transmission Corridors, namely the Central Corridor, as defined in and in terms of the procedures laid out in Government Notice (GN) No. 113. The proposed OHPL project will therefore be subject to a Basic Assessment (BA) Process in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) (as amended) and Appendix 1 of the EIA Regulations, 2014 promulgated in Government Gazette 40772 and GN R326, R327, R325 and R324 on 7 April 2017. The competent authority for this BA process is the national Department of Forestry, Fisheries and Environment (DFFE).

1.1.2 Project Location

The proposed 132kV Karreebosch OHPL, 33/132kV Substation and associated infrastructure is located 35km north of Matjiesfontein and extends across two provinces, namely the Northern and Western Cape Provinces. The proposed Karreebosch OHPL will extend from the proposed Karreebosch onsite 33/132kV substation, which is situated in Ward 3 of the Karoo Hoogland Local Municipality in the Namakwa District Municipality in the Northern Cape into Ward 2 of the Laingsburg Local Municipality in the Central Karoo District Municipality in the Western Cape Province, where it will connect to the existing 400kV Komsberg substation via the existing Bon Espirange substation.

The proposed Karreebosch OHPL will evacuate power from the authorised Karreebosch WEF (EA Ref: 14/12/16/3/3/2/807/AM3, which is currently undergoing a Part 2 EA amendment, final layout and EMPr approval process), located in the Northern Cape Province, and will connect to the existing Komsberg substation.

The proposed Karreebosch OHPL is proposed to be located over thirteen (13) properties **Table 1-1.** The location and layout of the properties on which the OHPL is located is provided in **Figure 1-1** below.

Table 1-1:Properties on which the OHPL is located

OHPL and Substation Alternative	Farm Name and Numbers	21 digit SG Code	Municipality / Province	Farm size (ha)
Komsberg Substation **Bon Espirange to Komsberg Route**	Portion 2 of Farm Standvastigheid No. 210	C07200000000021000002	Karoo Hoogland LM / Namakwa DM / Northern Cape	43.30
Bon Espirange to Komsberg Route	Farm Aprils Kraal No. 105	C04300000000010500000	Laingsburg LM / Central Karoo DM / Western Cape	559.68
Bon Espirange to Komsberg Route	Portion 1 of Farm Bon Espirange No. 73	C04300000000007300001	Laingsburg LM / Central Karoo DM / Western Cape	1916.64
Bon Espirange Substation **Bon Espirange to Komsberg Route** **Route 3**	Remainder of Farm Bon Espirange No. 73	C04300000000007300000	Laingsburg LM / Central Karoo DM / Western Cape	1764.25
Option 1A **Option 1B** **Option 1C** **Option 2B** **Option 2C** **Route 3**	Remainder of Farm Ek Kraal No.199	C07200000000019900000	Karoo Hoogland LM / Namakwa DM / Northern Cape	1407.48
Option 2B **Option 2C**	Portion 1 of Farm Ek Kraal No. 199	C07200000000019900001	Karoo Hoogland LM / Namakwa DM / Northern Cape	1772.90
Option 2B **Option 2C**	Portion 2 (Nuwe Kraal) of Farm Ek Kraal No. 199	C07200000000019900002	Karoo Hoogland LM / Namakwa DM / Northern Cape	824.94
Option 2B **Option 2C**	Remainder of Farm Karreebosch No. 200	C07200000000020000000	Karoo Hoogland LM / Namakwa DM / Northern Cape	1538.34
Substation Option 2 **Option 2A** **Option 2B** **Option 2C**	Remainder of Farm Wilgebosch Rivier No. 188	C07200000000018800000	Karoo Hoogland LM / Namakwa DM / Northern Cape	2898.91
Option 2A	Portion 1 of Farm Klipbanks Fontein No. 198	C07200000000019800001	Karoo Hoogland LM / Namakwa DM / Northern Cape	1886.62
Substation Option 1 **Option 1A** **Option 1B** **Option 1C** **Option 2A**	Remainder of Farm Klipbanks Fontein No. 198	C07200000000019800000	Karoo Hoogland LM / Namakwa DM / Northern Cape	1886.62
Option 1A **Option 1B** **Option 1C**	Farm Rietfontein No. 197	C07200000000019700001	Karoo Hoogland LM / Namakwa DM / Northern Cape	5873.66
Alternative: Bon Espirange to Komsberg Route	Remainder of Farm Standvastigheid No. 210	C07200000000021000000	Karoo Hoogland LM / Namakwa DM / Northern Cape	4716.71

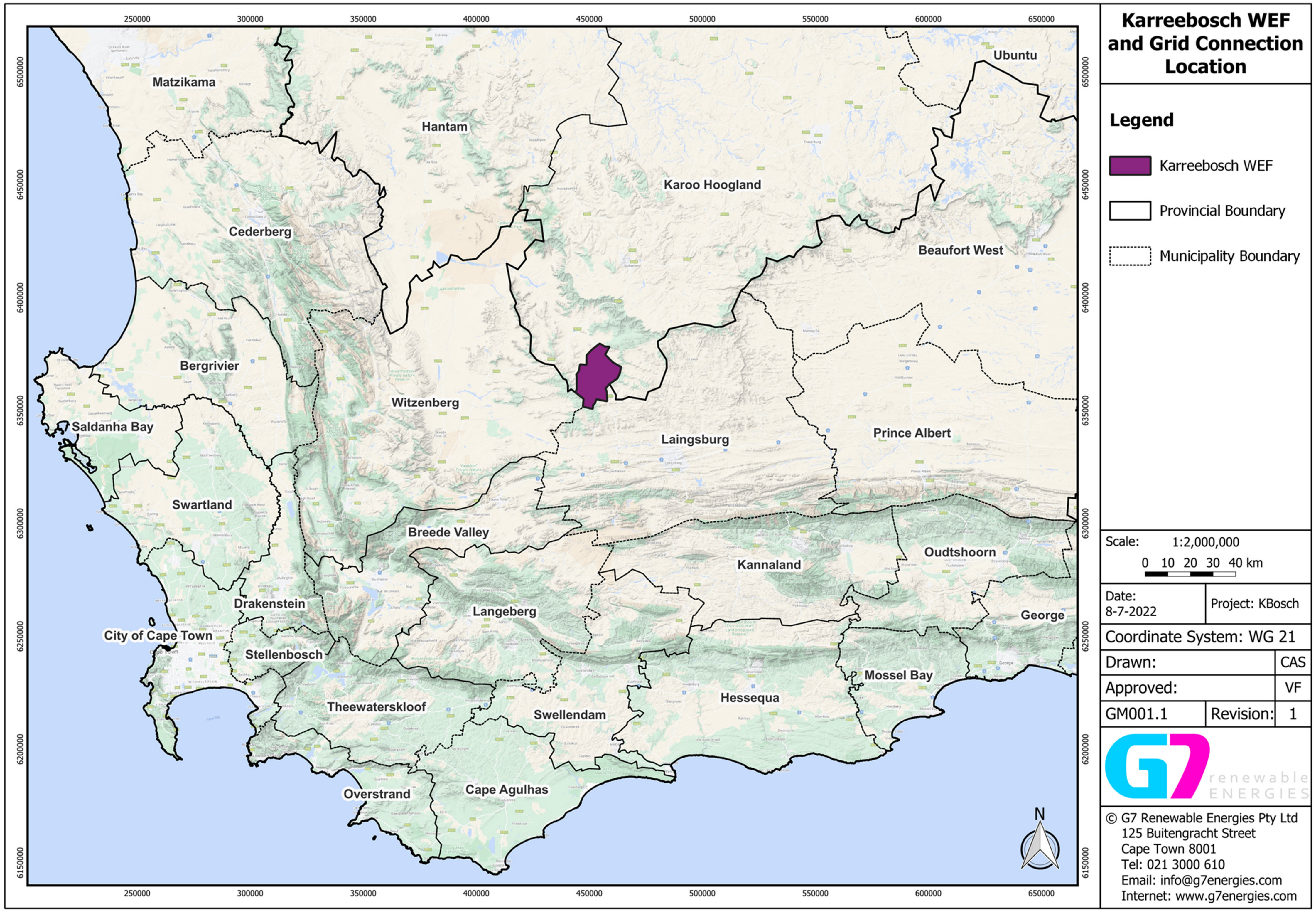

Figure 1-1:Locality Map

1.1.3 Project infrastructure

OVERHEAD POWERLINE

The OHPL will be a 132kV twin tern double circuit overhead powerline. The powerline towers will either be steel lattice or monopole structures. **Figure 1-2** below provides an example of a conventional lattice tower compared with a monopole structure. Pole positions will only be available once the powerline detail design has been completed by the Eskom Design Review Team (DRT). However, a 400m wide assessment corridor is being considered and has been walked down by the specialists for approval to allow for micro siting of tower positions once the detailed design has been completed. It is anticipated that towers will be located on average 200m to 250m apart; however, longer spans may be needed due to terrain and watercourse crossings.

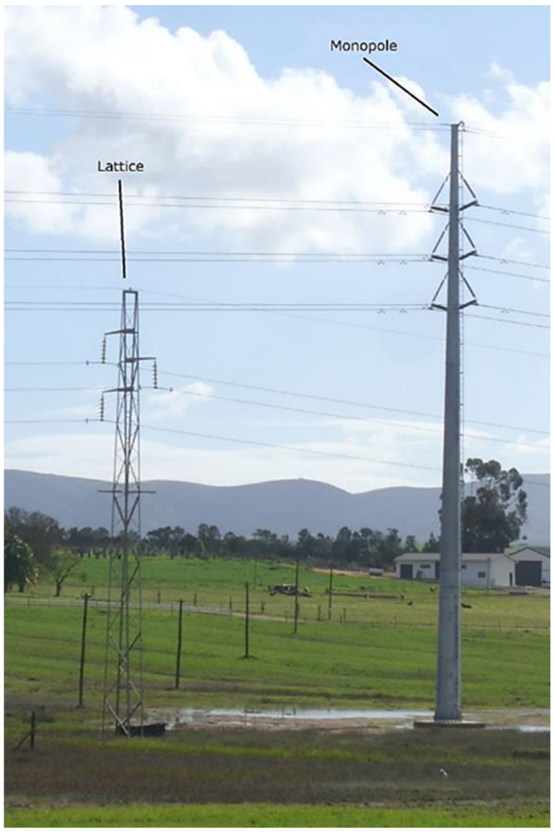

Figure 1-2:Conventional lattice powerline tower compared with a steel monopole structure

POWERLINE ALTERNATIVES

Only one (1) OHPL route is technically feasible for the section of the proposed powerline directly preceding the existing Bon Espirange Substation (Route 3) and for the section connecting the Bon Espirange substation to the Komsberg substation (Bon Espirange to Komsberg Route), which is approximately 9.2 km in length. ***No alternatives can therefore be provided for these two sections of the OHPL (Route 3 and Bon Espirange to Komsberg Route, as per* Figure 1-3 *below).***

Six (6) OHPL route alternatives (Options 1A, 1B, 1C, 2A, 2B and 2C) are proposed between the Karreebosch WEF onsite 33/132kV substation (with substation alternatives: Option 1 and Option 2) and Route 3 preceding the existing Bon Espirange Substation. As noted above, all of the six OHPL route alternatives follow the same routing from their point of convergence on Remainder of farm Ek Kraal No.199, approximately 3.1 km before the Bon Espirange Substation, to the Komsberg Substation situated on Portion 2 of Farm Standvastigheid No. 210.

These alternatives, as depicted in **Figure 1-3**, are described below:

- **OHPL Route Option 1:** Three (3) OHPL route alternatives are being considered for the link between Substation Option 1 and the Bon Espirange Substation and Komsberg Substation:
  - Option 1A (approximately 14.51 km in length in its entirety from Substation Option 1 to the Komsberg Substation);
  - Option 1B (approximately 17.28 km in length in its entirety from Substation Option 1 to the Komsberg Substation); and
  - Option 1C (approximately 13.91 km in length in its entirety from Substation Option 1 to the Komsberg Substation).
- **OHPL Route Option 2:** Three (3) powerline corridor route alternatives were considered for the link between Substation Option 2 and the Bon Espirange Substation and Komsberg Substation:
  - Option 2A (approximately 20.47 km in length in its entirety from Substation Option 1 to the Komsberg Substation);
  - Option 2B (approximately 16.63 km in length in its entirety from Substation Option 1 to the Komsberg Substation); and
  - Option 2C (approximately 20.52 km in length in its entirety from Substation Option 1 to the Komsberg Substation).

Alternatives 1A-C feed out of Substation Option 1 proposed in the south-central portion of the Farm Klipbanksfontein 198/1. Alternatives 2A-C feed out of Substation Option 2 proposed in the south-eastern corner of Wilgebosch Rivier 188/RE.

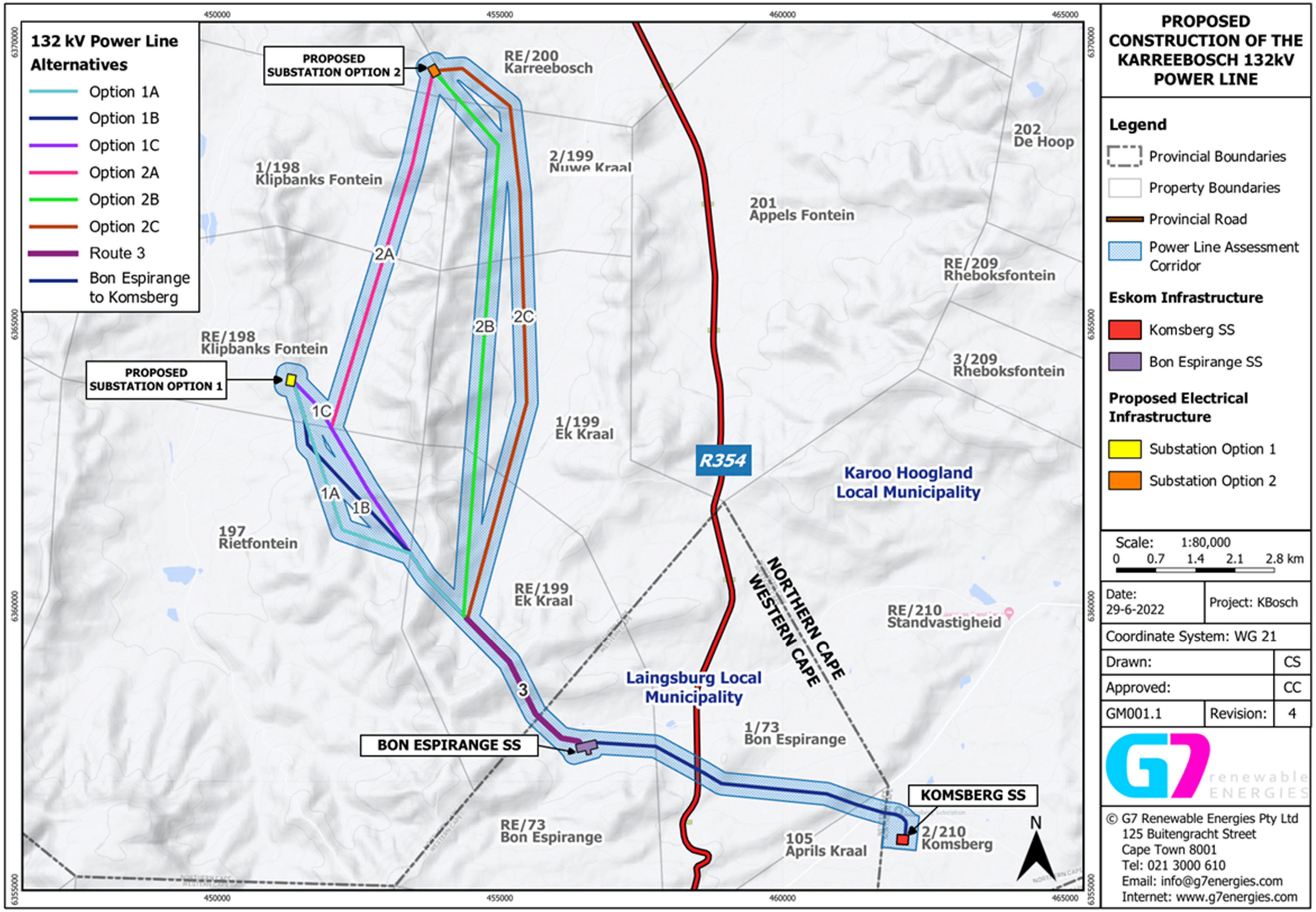

Figure 1-3:Powerline Route and Substation Alternatives for the Karreebosch OHPL

SERVITUDE

A 400m wide OHPL corridor (200m on either side of the centre line) has been assessed by the specialists for the purposes of the Basic Assessment Report (BAR). The registered servitude will fall within this 400m wide assessment corridor and will be 31m wide (15.5 m on either side of the centre line). The Right of Way servitude (servitude road) will be up to 14m wide (7m on either side of centre line), resulting in a total servitude width of 45m in total. The length of the longest powerline route alterative (Option 2C – see "Alternatives" section above) is 20.52 km, which will result in a servitude area of up to 92.3 ha.

The servitude is required to ensure safe construction, maintenance and operation of the powerline. Registration of the servitude grants the operator the right to erect, operate and maintain the powerline and to access the land to carry out such activities, but it does not constitute full ownership of the land. It should be noted that the OHPL will be ceded to Eskom post-construction. Construction and operation activities and access to the powerline will be carried out with due respect to the affected landowners. The servitude required for the Project will be registered at the Deeds Office and will form part of the title deed of the relevant properties once the environmental authorisation has been obtained.

SUBSTATIONS

Two alternative 33/132kV onsite substation locations at the Karreebosch WEF site have been assessed as part of this TIA, each with a 200m x 150m (3 ha) footprint. A 200m assessment area surrounding the proposed substation alternatives have been included as part of this assessment for micro siting, with a slight funnel leading into the existing Bon Espirange and Komsberg substations to allow for greater flexibility for micro siting for incoming proposed line connections. The proposed Karreebosch OHPL may require an extension of the existing 400kV Komsberg substation, and therefore, the entire Komsberg substation property has been assessed as part of this TIA.

1.2 Scope of work

The TIA will assess the transport impact of the powerline and substation on the existing transport network during the construction, operation and maintenance, as well as the decommissioning phases.

The report will deal with the items listed below and focuses on the surrounding road network that may be impacted by construction and maintenance of the site:

Traffic and route assessment

- Trip generation and potential traffic impact
- High-level feedback concerning possible travel routes
- Investigation of the impact of the development traffic generated during construction, operation, and decommissioning.

Access assessment

High-level input on the following from a transport planning point of view:

- Feasible location of access point(s)
- Motorised and non-motorised access requirements if required
- Queuing requirements as and if required
- Access geometry
- Sight distances and required access spacing

1.3 Approach and Methodology

The report assesses the traffic impact of the construction, operation and decommissioning of the powerline on the surrounding road network in the vicinity of the site.

This transport study includes the following tasks:

Project Assessment

- Overview of project background information, including previous studies, location maps, component specs and any resulting abnormal loads to be transported
- Research of all available documentation and information relevant to the proposed windfarm and substations

Traffic and Route Assessment

- Trip generation and potential traffic impact
- Possible material and plant delivery routes to the site
- Estimation of construction and maintenance (operational) vehicle trips
  - Generated vehicles trips
  - Abnormal load trips
- Investigation of the impact of the development traffic generated during construction, operation and decommissioning.
- Access requirements and recommendations

Report (Documentation and Figures)

- Reporting on all findings and recommendations.

1.4 General assumptions

The following assumptions were made:

- According to the Eskom Specifications for Power Transformers, maximum height, width, and length limitations of 5 000mm, 4 300mm and 10 500mm must be kept when transporting the transformer.
- Maximum vertical height clearances along the haulage routes is 5.2 m for abnormal loads.
- The imported elements will be transported from the most feasible port of entry, the Port of Saldanha.
- All haulage trips will occur on either surfaced national and provincial roads or existing gravel roads.
- Material for constructing internal access roads will be sourced locally as far as possible.
- The decommissioning phase will have a similar transport impact as the construction phase.

1.5 Source of information

Information used in a transport study includes:

- Project information provided by the Client
- Google Earth kmz provided by the Client
- Google Earth Satellite Imagery
- Chief surveyor general website
- TRH11, Dimensional and mass limitations and other requirements for abnormal loads, August 2009
- The Technical Recommendations for Highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads", 2000
- National Road Traffic Act, Act 93 of 1996
- National Department of Transport (NDoT), Manual for Traffic Impact Studies, October 2005
- Department of Transport (DoT), Geometric Design of Rural Roads, 1988
- SANS 10280/NRS 041-1:2008 Overhead Power Lines for Conditions Prevailing in South Africa
- Manual for Traffic Impact Studies, Department of Transport, 1995
- TRH26 South African Road Classification and Access Management Manual, COTO
- TMH 16 South African Traffic Impact and Site Traffic Assessment Manual (Vol 1), COTO, August 2012
- TMH 16 South African Traffic Impact and Site Traffic Assessment Manual (Vol 2), COTO, February 2014

2 SITE DESCRIPTION

2.1 General

The proposed 132kV Karreebosch OHPL, 33/132kV Substation and associated infrastructure is to be located 35km north of Matjiesfontein, and extends across two provinces, namely the Northern and Western Cape Provinces. The proposed Karreebosch OHPL will extend from the proposed Karreebosch onsite 33/132kV substation, which is situated in Ward 3 of the Karoo Hoogland Local Municipality in the Namakwa District Municipality in the Northern Cape into Ward 2 of the Laingsburg Local Municipality in the Central Karoo District Municipality in the Western Cape Province, where it will connect to the existing 400kV Komsberg substation via the existing Bon Espirange substation.

2.2 Site access points

The proposed Karreebosch powerline can be accessed from a main site access point off the R354, located at the site's eastern end. The R354 is a Class 2 minor arterial route running in a north-south-direction from Matjiesfontein to the R356 in the Northern Cape. The road is a surfaced single carriageway with one lane per direction.

The main access (Access 01) is located off an existing access road. Access 01 will be used to access the site for the construction, operation, and maintenance of the powerline. Access 01 is located off an existing access road; therefore, access spacing restrictions are not envisaged.

Access 01 is located off a straight horizontal curve with relatively flat terrain; therefore, sight line restrictions are not envisaged.

It is also recommended that appropriate signage is accommodated to warn road users of the access points and that the road reserve be maintained to prevent obstructions to sight lines.

It should be noted that road upgrades may be required along existing access roads to accommodate expected vehicles. Additional roads may need to be established to access the entire powerline route.

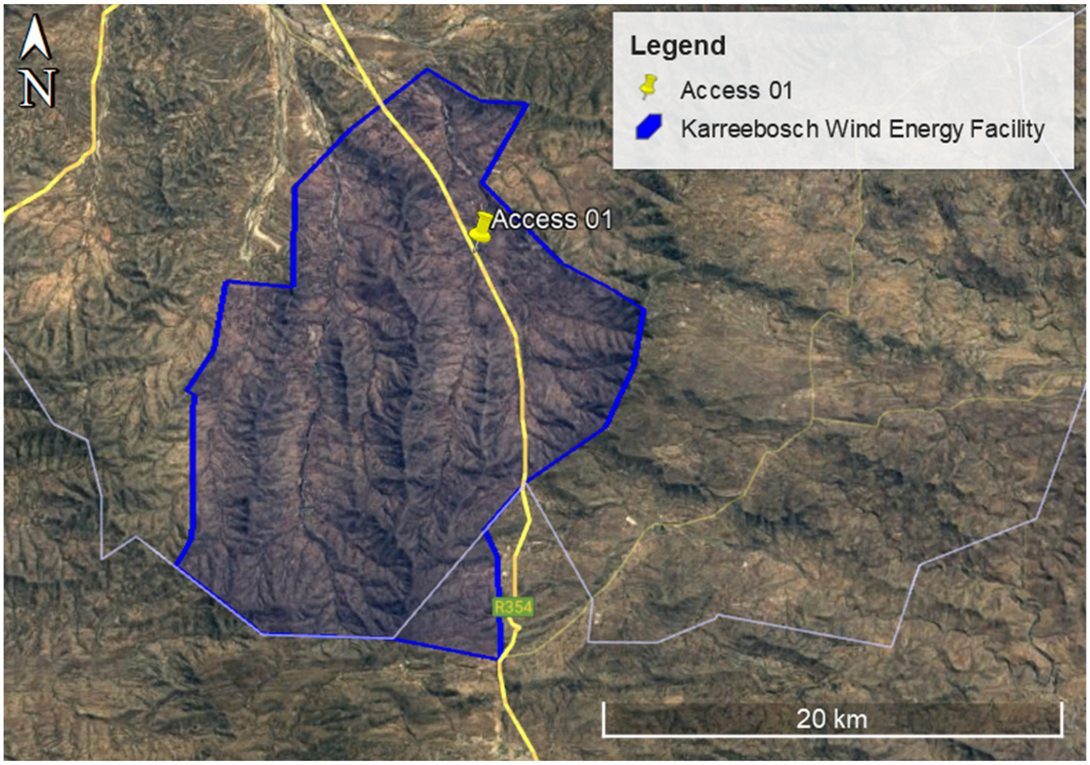

Figure 2-1:The Proposed Site Access

It is recommended that the following aspects be considered for the detailed design of the site access points:

- staggered intersections should be avoided where possible.
- The access points to the site will need to be able to cater for construction and abnormal load vehicles.
- A minimum road width of 8m is recommended for the access points and the internal roads can have a minimum width of 5m.
- The radius at the access point needs to be large enough to allow for all construction vehicles to turn safely.
- It is recommended that the site access to the facility be access controlled. It is also recommended that security staff be stationed on site at the access during construction.
- A minimum stacking distance of 25m is recommended between the road edge of the external road and the access control.
- All road markings and signage need to be in accordance with the South African Road Traffic Signs Manual (SARTSM).

3 TRANSPORTATION ROUTES

3.1 Main Route for the Transportation of Materials and Plant to the proposed Site

Building materials will most likely be sourced from Worcester, approximately 179km from the site or alternatively from Cape Town, approximately 306 km from the site. A significant reduction in heavy vehicle trips can be achieved by using mobile batch plants. In addition, temporary construction material stockpile yards could be commissioned on vacant land near the site or on the construction camp. Delivery of materials to the mobile batch plant and the stockpile yard could be staggered to minimise traffic disruptions.

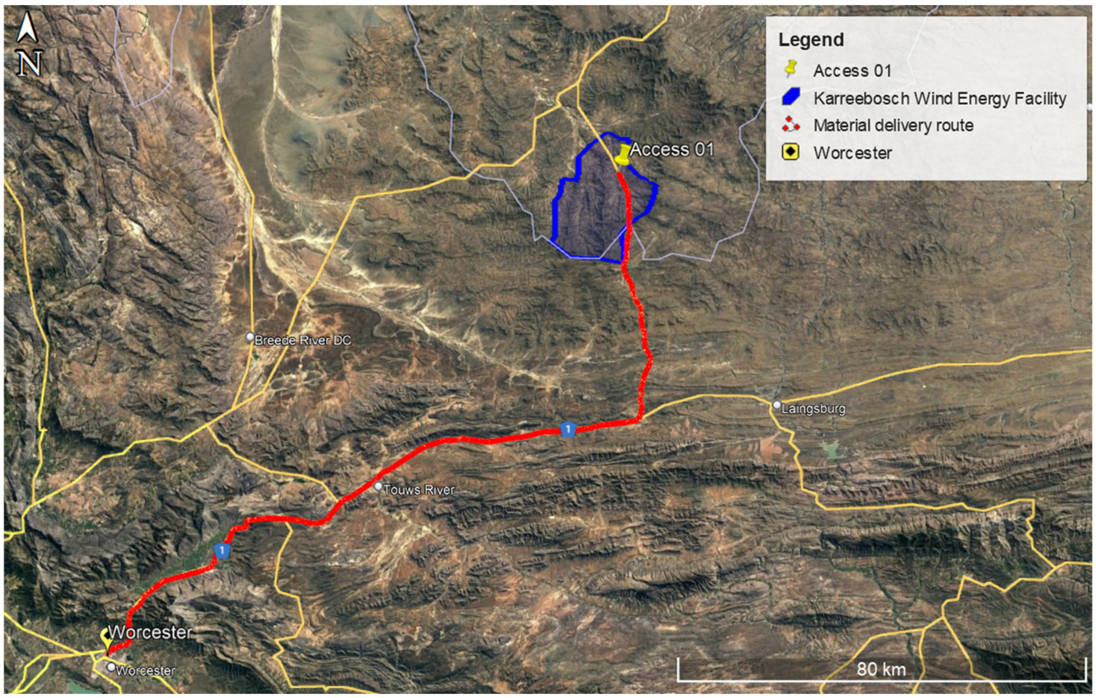

Figure 3-1: Envisaged route for material delivery

3.2 Main route for the transportation of site workers

The workforce will likely reside in the closest communities of Sutherland, Matjiesfontein, Touws River, or Laingsburg. These towns connect to the site via the N1 and the R354. Due to a lack of public transport near the site, it is recommended that a majority of construction personnel be transported to and from the site by means of high occupancy transport such as busses or minibus taxis. This will reduce the number of trips bound for the site.

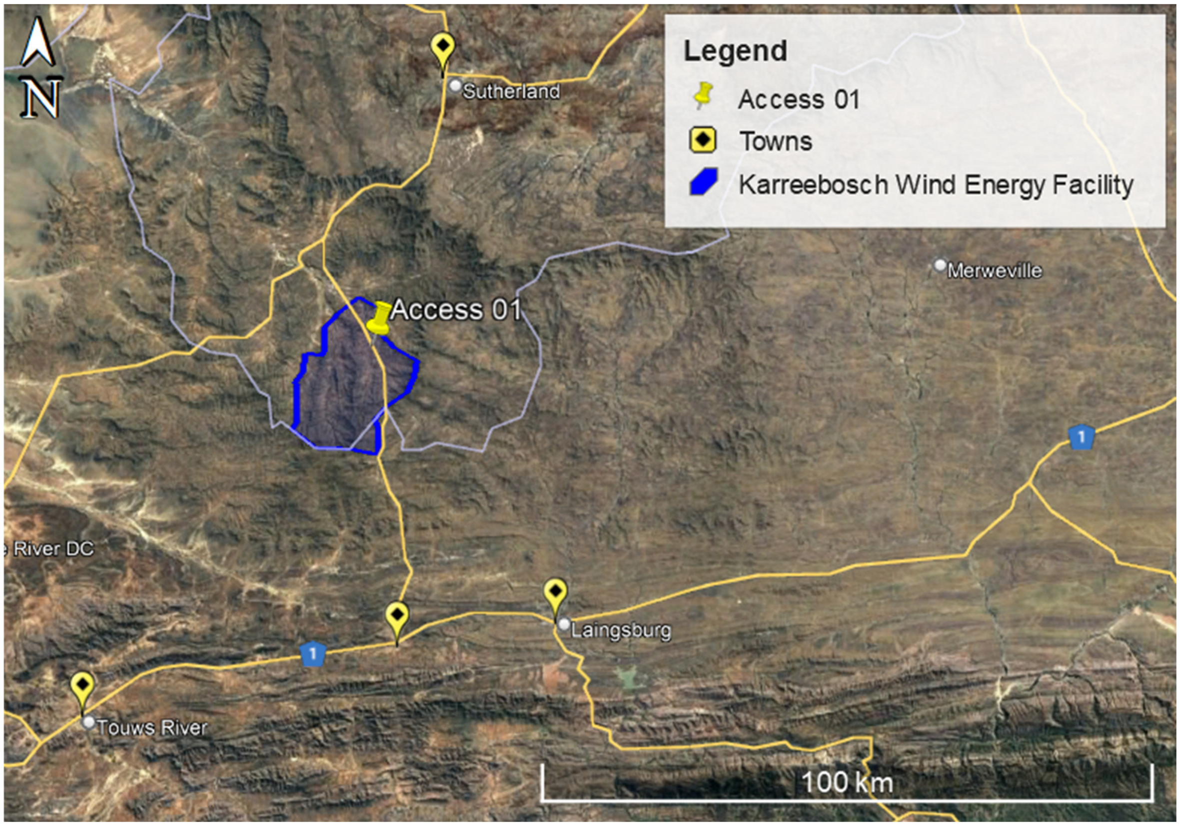

Figure 3-2:Routes from the nearest towns to site

4 DESCRIPTION OF PROJECT ASPECTS RELEVANT TO THE TRANSPORT STUDY

4.1 Transportation requirements

4.2 Transporting Material and Equipment

Powerlines are a system of overhead transmission lines and underground cables. Their primary function is to transfer power from an electrical generation source to a substation from which distribution to the consumer will occur.

The typical materials/components required for powerlines include:

- Towers/poles to support the electrical cables. These can be made from wood, steel, aluminium, concrete or reinforced plastic options,
- Wire conductors are typically made of aluminium,
- foundations for towers/poles,
- Dampers,
- Ground wires,
- Insulators, and
- Transformer.

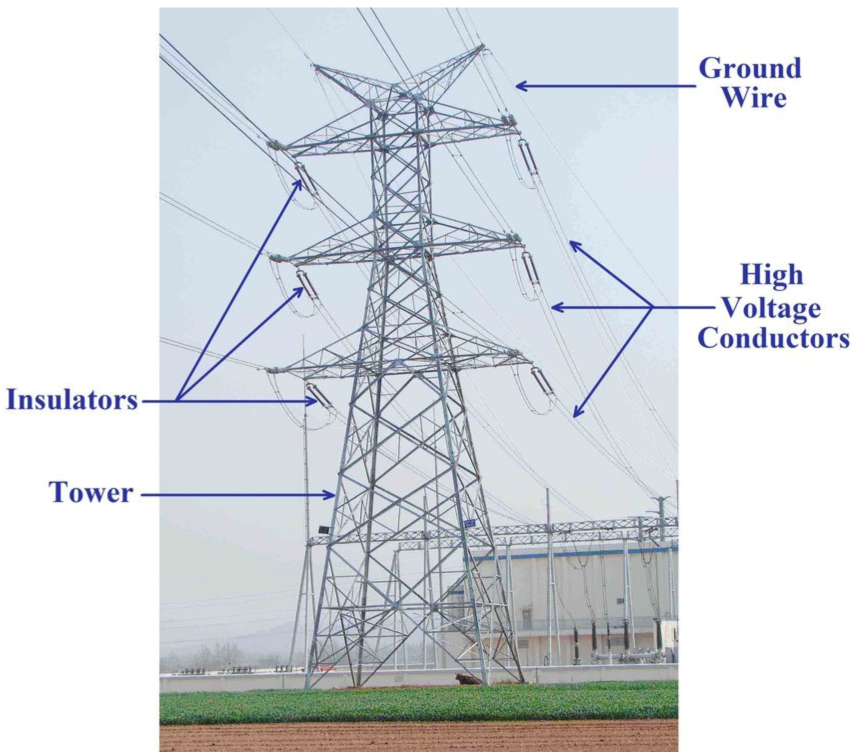

Figure 4-1:Typical High voltage Power Transmission system (Chakraborty, 2017)

The Karreebosch powerline components are expected to be locally sourced and transported to the site using appropriate National and Provincial routes. It is expected that the components will generally be transported to the site with normal heavy load vehicles.

4.3 Transporting equipment

Crane technology has developed rapidly, and several different heavy lifting options are available on the market. During construction, the expected abnormal vehicles will be lifting equipment required to off-load and assemble the components. For this assessment, a mobile crane is considered. Mobile cranes are classified as non-load carrying vehicles.

Mobile cranes usually exceed mass and legal dimension limits and must therefore be operated under a permit.

Figure 4-2: Mobile Crane (Plant equipment, n.d.)

4.3.1 Abnormal Load Considerations

Abnormal permits are required for vehicles exceeding the following permissible maximum dimensions and mass on road freight transport in terms of the Road Traffic Act (Act No. 93 of 1996):

- Length: 22m for an interlink, 18.5m for truck and trailer, and 13.5m for a single unit truck,
- Width: 2.6m,
- Height: 4.3m measured from the ground. Possible height of load – 2.7m,
- Weight: Gross vehicle mass of 56t resulting in a payload of approximately 30t,
- Axle unit limitations: 18t for dual and 24t for triple-axle units, and
- Axle load limitation: 7.7t on the front axle and 9t on single or rear axles,

Any dimension/mass exceeding the above will be classified as an Abnormal Load and will necessitate an application to the Department of Transport and Public Works for a permit that will give authorisation for the conveyance of said load. A permit is required for each Province that the haulage route traverses.

4.3.2 Further Guideline Documentation

The Technical Recommendations for Highways (TRH 11) is a draft Guideline for Granting of Exemption Permits for the Conveyance of Abnormal Loads and other Events on Public Roads. The manual outlines the rules and conditions for transporting abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits. Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed concerning the damaging effect on road pavements, bridges, and culverts.

The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are discussed. Reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for granting permits for all other exemptions from the requirements of the Road Traffic Act and the relevant regulations.

4.4 Permitting – General Rules

The limits recommended in TRH 11 serve as a guide to the Permit Issuing Authorities. Each administration has the right to refuse a permit application or modify the conditions to grant a permit. It is understood that:

a. A permit is issued at the sole discretion of the Issuing Authority. The Issuing Authority may refuse a permit because of the condition of the road, the culverts, and bridges, the nature of road traffic, excessive heavy traffic during specific periods, or for any other reason.

b. A permit can be withdrawn if the vehicle is inspected and found unfit for operation.

c. During specific periods, such as school holidays or long weekends, an embargo may be placed on the issuing of permits. Embargo lists are compiled annually and are obtainable from the Issuing Authorities.

4.4.1 Load Limitations

The maximum load that a road vehicle or combination of vehicles will be allowed to carry legally under permit on a public road is limited by:

- the vehicle capacity as rated by the manufacturer,
- the load which may be carried by the tyres,
- the damaging effect on pavements,
- the structural capacity on bridges and culverts,
- the power of the prime mover(s),
- the load imposed by the driving axles, and
- the load imposed by the steering axles.

4.4.2 Dimensional Limitations

A load of abnormal dimensions may cause an obstruction and danger to other traffic. For this reason, all vehicle loads must, as far as possible, conform to the legal dimensions. Permits are only considered for loads that cannot be divided into two or more loads for transport on public roads without disproportionate effort, expense, or risk of damage. Each of the characteristics below has legally permissible limits on what is allowed under the permit.

- Width
- Height
- Length
- Front Overhang
- Rear Overhang
- Front Load Projection
- Rear Load Projection
- Wheelbase
- Turning Radius
- Stability of Loaded Vehicles

5 IDENTIFICATION OF TRAFFIC IMPACT

5.1 Activities with potential traffic impact

The traffic expected to be generated by the proposed powerline can be divided into three phases:

5.1.1 Construction phase

Construction traffic will include vehicles for deliveries, removal of materials and construction staff.

1. **Material and component delivery:** Vehicle trips from material and component delivery vary depending on the construction task/program, fuel supply arrangements, as well as the distance from the material source to the site. Not enough detail about the powerline and construction programming is known to provide an estimated trip generation volume for material and component traffic.

   The materials and components expected for the powerline construction can generally be transported by normal heavy load vehicles. Project planning can be used to reduce delivery trips during peak hours. In addition to this, using a mobile batch plant as well as temporary construction material stockpile yards near the site or on the construction camp can also reduce peak hour trips.

2. **Construction machinery:** This includes cranes for pylon/tower assembly, heavy vehicles required for earthworks etc. These vehicles are expected to have negligible traffic impact as they will arrive on-site in preparation for construction. Once on-site, these vehicles will produce internal site traffic with minimal effect on the external road network.

3. **Site personnel and workers:**

Based on information obtained from similar projects, the following trip generation assumptions are made for construction personnel:

	Activity	**traffic comments**	**Approx. team size**	**Approx. duration at a point (i.e., tower location)**
1	Centre line pegging and identification of new gates	(light vehicle access)	3	1 day
2	Access Negotiations	(light vehicle access)	1	1 day
3	Tower Pegging	(light vehicle access)	5	1 days
4	New gate installation	(light vehicle access)	5	1 days
5	Foundation nominations (for main structure and anchors)	(heavy vehicle access)	5	2 days
6	Excavation of foundation	(heavy vehicle access)	10	2 days
7	Foundation steelwork (reinforcing)	(heavy vehicle access)	10	2 days
8	Foundation (concrete) pouring	(heavy vehicle access)	20	2 days
9	Delivery of tower steelwork	(heavy vehicle access)	5	1 day
10	Assembly team / Punching and painting	(light vehicle access)	10	3 days
11	Erection	(abnormal load vehicle access)	20	2 days
12	Stringing	(abnormal load vehicle access) (intensive vehicle activity likely within the working area)	50	7 days
13	Sag and tension	(heavy vehicle access)	10	3 days
14	Rehabilitation	(heavy and light vehicle access)	5 to 15	2 – 10 days

It is assumed that the same team will move together from one construction location to the next. Based on this assumption a maximum of 50 to 70 workers can be expected on site per workday.
Based on traffic station data sourced from the Western Cape Government Road Network Information System, there are no taxis or busses operating along the R354. It is recommended that the majority of construction personnel be transported to and from site by means of busses or minibus taxis.

Busses have an average of 65 passenger capacity, while minibus taxis have an average passenger capacity of 15. Assuming approximately 20% of highly skilled personnel will travel by means of passenger vehicles, the following trips are assumed:

- for the skilled personnel, a maximum of 14 trips are expected.
- The remaining 56 workers can travel by bus (i.e., 1 (one) bus trip) or 4 (four) minibus taxi trips.

Depending on the construction schedule, a maximum of 18 peak-hour site personnel trips is assumed for the purposes of this assessment. This volume is deemed to generate an insignificant traffic impact.

The potential transport impacts imposed by the construction traffic are temporary, short-term in nature, and can be mitigated to an acceptable level.

5.1.2 Operation and maintenance phase

Traffic during the operational phase will consist of maintenance staff maintaining the proposed facility. The trips generated during this phase are deemed low because the operational trips will only be for occasional maintenance requirements. To consider a worst-case scenario, between 5 to 15 peak-hour staff trips are assumed at this stage.

5.1.3 Decommissioning phase

The decommissioning phase will generate construction-related traffic, including transportation of people, construction materials, water and equipment. It is therefore expected that the decommissioning phase will generate the same impact as that of the construction phase.

6 ASSESSMENT OF TRAFFIC RELATED ENVIRONMENTAL IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

6.1 Potential Impact (Construction Phase or Decommissioning Phase)

The decommissioning phase will generate construction related traffic including transportation of people, construction materials, water and equipment (abnormal trucks transporting turbine components). It is therefore expected that the decommissioning phase will generate the same impact as that of the construction phase.

Nature of the impact

- Noise and dust pollution associated potential traffic

Table 6-1: Impact Assessment Table (Construction Phase)

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Noise and dust pollution associated potential traffic									
Without Mitigation	2	2	3	2	4	**36**	**Moderate**	(-)	High
With Mitigation	1	1	3	2	3	**21**	**Low**	(-)	moderate
Possible Mitigation and Management Measures	▪ The delivery of components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods. ▪ Dust suppression of gravel roads during the construction phase, as required. ▪ Regular maintenance of site gravel roads by the Contractor when needed. ▪ The use of mobile batch plants and quarries near the site would decrease traffic on the surrounding road network. ▪ Staff and general trips should occur outside of peak traffic periods as far as possible.								

6.2 Potential Impact (Operation Phase)

Nature of the impact

- Noise and dust pollution associated potential traffic

Table 6-2:Potential Impact (Operation Phase)

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Noise and dust pollution associated potential traffic									
Without Mitigation	2	2	3	2	3	**27**	**Low**	(-)	High
With Mitigation	1	1	1	2	3	**15**	**Low**	(-)	moderate
Mitigation and Management Measures	▪ Consider scheduling shift changes to occur during off peak hours. ▪ Regular maintenance of site gravel roads by the Owner/Facility Manager when needed.								

6.3 Potential cumulative Impact (Construction Phase or Decommissioning Phase)

The cumulative impact assumes that all wind farms within 30km currently proposed and/or approved, would be constructed at the same time. It must be noted that this is a conservative approach.

Nature of the impact

- Noise and dust pollution associated potential traffic

Table 6-3:Potential cumulative Impact (Construction Phase or Decommissioning Phase)

Potential Impact Noise and dust pollution associated potential traffic	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
Without Mitigation	2	3	3	2	4	**40**	**Moderate**	(-)	High
With Mitigation	1	2	3	2	3	**24**	**Low**	(-)	moderate
Mitigation and Management Measures	▪ The delivery of components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods. ▪ Dust suppression of gravel roads during the decommissioning phase, as required. ▪ Regular maintenance of site gravel roads is required by the Contractor during the decommissioning phase. ▪ Staff and general trips should occur outside of peak traffic periods as far as possible.								

7 CONCLUSION AND RECOMMENDATIONS

7.1 General

This report pertains to the transport impact input for developing the Karreebosch 132kV overhead power line, 33/132 KV substation and associated infrastructure. The powerline is required to evacuate the power generated by the proposed Karreebosch Wind Energy Facility (WEF).

The proposed 132kV Karreebosch OHPL, 33/132kV Substation and associated infrastructure is to be located 35km north of Matjiesfontein, and extends across two provinces, namely the Northern and Western Cape Provinces. The proposed Karreebosch OHPL will extend from the proposed Karreebosch onsite 33/132kV substation, which is situated in Ward 3 of the Karoo Hoogland Local Municipality in the Namakwa District Municipality in the Northern Cape into Ward 2 of the Laingsburg Local Municipality in the Central Karoo District Municipality in the Western Cape Province, where it will connect to the existing 400kV Komsberg substation via the existing Bon Espirange substation.

The proposed Karreebosch OHPL will evacuate power from the authorised Karreebosch WEF (EA Ref: 14/12/16/3/3/2/807/AM3, which is currently undergoing a Part 2 EA amendment, final layout and EMPr approval process), located in the Northern Cape Province, and will connect to the existing Komsberg substation.

7.2 Access and internal circulation

- The main access to the site provides access to the project site and connects off the R354.
- Additional access roads or tracks may be required to provide access to sections of the powerline route.
- The main access (access 01) is located off an existing access point thus access spacing restrictions are not envisaged. This access is located off a straight horizontal curve section of the R354 thus sight line issues are not envisaged.
- It is recommended that appropriate signage is accommodated to warn road users of the access points and that the road reserve be maintained to prevent obstructions to sight lines.
- It needs to be noted that all access and internal roads should be investigated for their topographical suitability, i.e., feasibility for plant and truck access and height clearance for any Eskom lines, Telkom lines or similar.
- staggered intersections should be avoided where possible.
- The access points to the site will need to be able to cater for construction and abnormal load vehicles.
- A minimum road width of 8m is recommended for the access points and the internal roads can have a minimum width of 5m.
- The radius at the access point needs to be large enough to allow for all construction vehicles to turn safely.
- It is recommended that the site access to the facility be access controlled. It is also recommended that security staff be stationed on site at the access during construction.
- A minimum stacking distance of 25m is recommended between the road edge of the external road and the access control.
- All road markings and signage need to be in accordance with the South African Road Traffic Signs Manual (SARTSM).

7.3 Preferred Route for Materials, Plant and Labour

It is envisaged that the majority of materials, will be sourced from Worcester approximately 179km from the site or alternatively from Cape Town approximately 306 km from the site. The travel route from Worcester to the site travels through the N1 and the R354.

The workforce will most likely reside in Sutherland, Matjiesfontein, Touws River or Laingsburg as the closest communities. The travel routes form these towns to the site include the N1 and the R354. These are higher order routes as such geometric limitations are not envisaged.

7.4 Traffic impact

No capacity improvements are considered necessary based on the following:

- The site gains access of the R354, which is a Class 2 road designed to accommodate large traffic volumes.
- The only notable generated traffic would occur during the construction and decommissioning phases. The trips generated during these phases will only occur for short periods of time and the following mitigation measures are recommended for consideration:
  - i. The delivery of materials and components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods,
  - ii. The use of mobile batching plants and any material sources near the site would decrease the impact on the surrounding road network,
  - iii. Staff and general trips should occur outside of peak traffic periods where possible,
  - iv. Staff can be shuttled on scheduled busses to minimise the number of trips; and
  - v. Stagger the removal of towers, foundations, conductors etc during the decommissioning phase.

7.5 Assessment of traffic related environmental Impacts and Identification of Management Actions

i. The construction phase includes the construction of the Facility, including construction of the roads, excavations, trenching and ancillary construction works. This phase will temporarily generate the most development traffic.

The nature of environmental impact expected with construction traffic is noise and dust pollution. It is estimated that the construction traffic will have a moderate significance rating pre mitigation and a low significance rating post mitigation.

Proposed impact mitigation measures

- The delivery of components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.
- Dust suppression of gravel roads as required.
- Regular maintenance of site gravel roads by the Contractor when needed.
- The use of mobile batch plants and quarries near the site would decrease traffic on the surrounding road network.
- Staff and general trips should occur outside of peak traffic periods as far as possible.

ii. The operation and maintenance phase include the operation and maintenance of the powerline

The nature of environmental impact expected with operational traffic is noise and dust pollution. It is estimated that the operational traffic will have a low significance rating pre mitigation and post mitigation.

Proposed mitigation measures

- Consider scheduling material delivery and worker trips to occur during off peak hours.
- Regular maintenance of site gravel roads by the Owner/Facility Manager when needed.

iii. The decommissioning phase will generate construction related traffic including transportation of people, construction materials, water and equipment (abnormal trucks transporting turbine components). It is therefore expected that the decommissioning phase will generate the same impact as that of the construction phase.

iv. The cumulative impact assumes that all wind farms within 30km currently proposed and/or approved, would be constructed at the same time. It must be noted that this is a conservative approach.

The nature of environmental impact expected is noise and dust pollution. It is estimated that the construction traffic will have a moderate significance rating pre mitigation and a low significance rating post mitigation.

The mitigation measures proposed for the site construction phase are proposed considered for the cumulative impacts during the construction stage.

8 SUMMARY

The aim of this study was to investigate all traffic and transportation related matters pertaining to Karreebosch 132kV overhead power line, 33/132 KV substation and associated infrastructure. The site is to be located in the Laingsburg Municipality (LM), Western Cape Province, and in the Karoo Hoogland Municipality (KHM), Northern Cape Province.

With the proposed mitigation measures, the construction, operation and maintenance, as well as the decommissioning phase of the Kareebosch grid infrastructure is not envisaged to generate a significant traffic impact on the surrounding road network.

The development of this grid infrastructure is supported from a traffic engineering point of view, provided that the recommendations in this report are adhered to and are read in conjunction with the road design and environmental reports completed for this site.

9 REFERENCES

1. Chakraborty, R., 2017. *Studies on Silicone Rubber Insulators used for High Voltage Transmission.* [Online] Available at: https://www.researchgate.net/publication/324703849_Studies_on_Silicone_Rubber_Insulators_used_for_High_Voltage_Transmission
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ANNEXURE A: IMPACT ASSESSMENT METHODOLOGY

BASIC ASSESSMENT PROCESS

OBJECTIVES OF THE BASIC ASSESSMENT PROCESS AS PER THE PROCEDURAL FRAMEWORK

As defined in Appendix 1 of the EIA Regulations, 2014 (as amended), the objective of the impact assessment process is to, through a consultative process:

— Determine the policy and legislative context within which the proposed activity is located and how the activity complies with and responds to the policy and legislative context;
— Identify the alternatives considered, including the activity, location, and technology alternatives;
— Describe the need and desirability of the proposed alternatives;
— Through the undertaking of an impact and risk assessment process, inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage, and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine—
  - The nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and
  - The degree to which these impacts—
    - Can be reversed;
    - May cause irreplaceable loss of resources; and
    - Can be avoided, managed, or mitigated.
— Through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to–
  - Identify and motivate a preferred site, activity and technology alternative;
  - Identify suitable measures to avoid, manage or mitigate identified impacts; and
  - Identify residual risks that need to be managed and monitored.

BASELINE ENVIRONMENTAL ASSESSMENT

The description of the environmental attributes of the project area was compiled through a combination of desktop reviews and site investigations. Desktop reviews made use of available information including existing reports, aerial imagery, and mapping.

IMPACT ASSESSMENT METHODOLOGY

ASSESSMENT OF IMPACTS AND MITIGATION

The assessment of impacts and mitigation evaluates the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

The key objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed project, and to propose a significance ranking. Issues / aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and

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resources and receptors to provide a detailed discussion of impacts. The assessment considers direct[1], indirect[2], secondary[3] as well as cumulative[4] impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e. residual impact). The significance of environmental aspects is determined and ranked by considering the criteria[5] presented in **Table 1**.

Table 1: Impact Assessment Criteria and Scoring System

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				

IMPACT SIGNIFICANCE RATING			
Total Score	0 – 30	31 to 60	61 – 100
Environmental Significance Rating (Negative (-))	**Low (-)**	**Moderate (-)**	**High (-)**
Environmental Significance Rating (Positive (+))	**Low (+)**	**Moderate (+)**	**High (+)**

IMPACT MITIGATION

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the proposed development's actual extent of impact and are included to

[1] Impacts that arise directly from activities that form an integral part of the Project.
[2] Impacts that arise indirectly from activities not explicitly forming part of the Project.
[3] Secondary or induced impacts caused by a change in the Project environment.
[4] Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.
[5] The definitions given are for guidance only, and not all the definitions will apply to all the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this report.

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five (5) different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

The mitigation sequence/hierarchy is shown in **Figure 0-1** below.

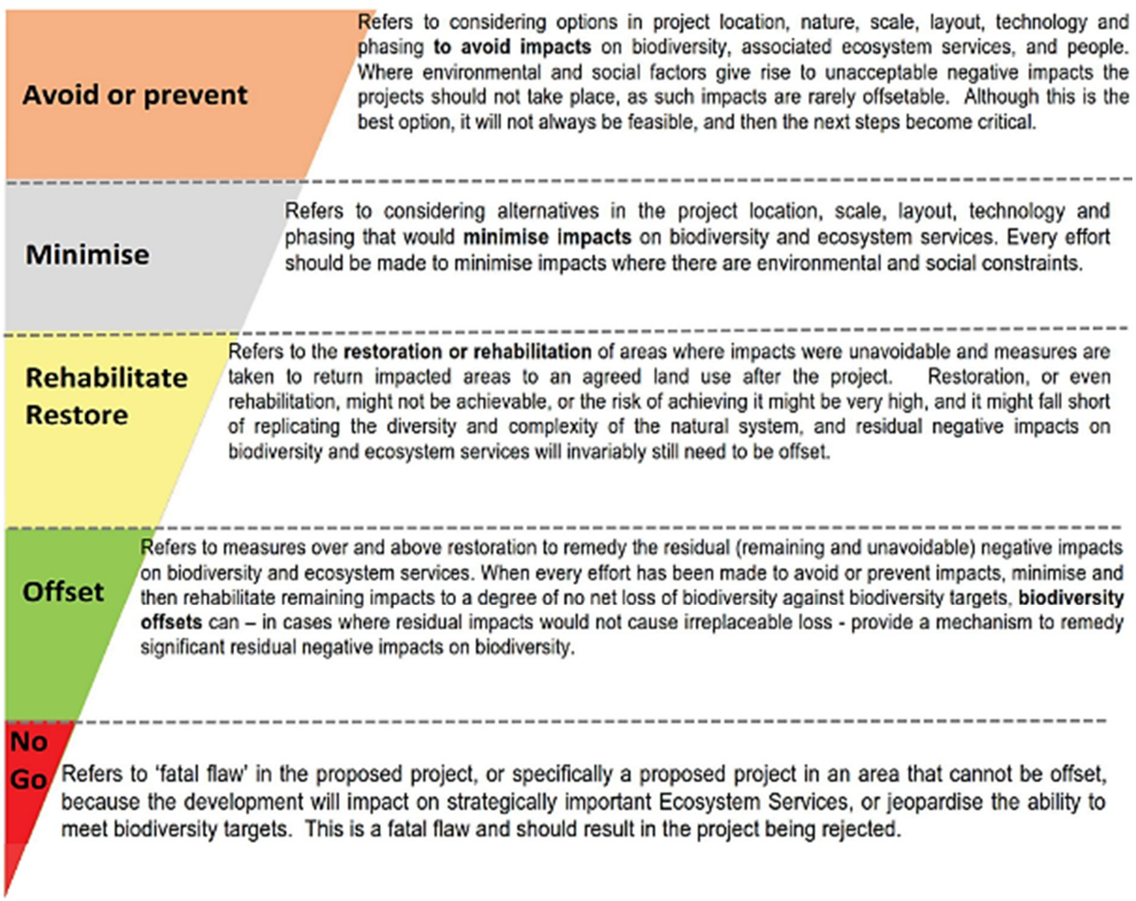

Figure 0-1: Mitigation Sequence/Hierarchy

1 ENVIRONMENTAL IMPACT ASSESSMENT

This Chapter identifies the perceived environmental and social effects associated with the proposed Project. The assessment methodology is outlined above. The issues identified stem from those aspects presented in the baseline assessment as well as project description provided. The impact assessment will be based on the preferred alternative at all project phases. This section only assesses the preferred option along with the no-go section. The mitigation hierarchy criteria for each mitigation measure are indicated in brackets after each measure indicated.

Furthermore, the decommissioning assessment will be considered as part of the decommissioning process that will be subject to a separate authorisation and impact assessment process. The impact assessment in this section encompasses the geographical, physical, biological, social, economic, heritage and cultural aspects in accordance with Appendix 1 of GNR 326.

An example of how the impact assessment methodology is applied is provided below:

1.1 AIR QUALITY

1.1.1 CONSTRUCTION PHASE

DUST AND PARTICULATE MATTER

The National Dust Control Regulations (GNR 827) prescribe general measures for the control of dust in both residential and non-residential areas and will be applicable during construction of the OHPL. **Table 2** provides the acceptable dust fall rates as prescribed by GNR 827.

Table 2: Acceptable dust fall rates (GNR 827)

RESTRICTION AREAS	DUST FALL RATE (D) ($mg/m^2/day$ – 30 DAYS AVERAGE)	PERMITTED FREQUENCY OF EXCEEDING DUST FALL RATE
Residential area	D < 600	Two within a year, not sequential months
Non-residential area	600 < D < 1200	Two within a year, not sequential months

During the construction phase, dust and vehicular emissions (carbon monoxide (CO), hydrocarbons, particulate matter (PM) and nitrogen oxides (NO_x) will be released as a result of vegetation clearing activities, transportation of equipment and materials to site, and the installation thereof, all of which involves the movement of large plant and trucks along unpaved roads and exposing of soils. The emissions will, however, have short-term impacts on the immediate surrounding areas that can be easily mitigated and thus the authorisation of such emissions will not be required. All construction phase air quality impacts will be minimised with the implementation of dust control measures contained within the EMPr.

The impact of the construction phase on the generation of dust and particulate matter (PM) is shown in **Table 3** below.

Table 3: Construction Impact on Generation of Dust and PM

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character	Confidence
GENERATION OF DUST AND PM									
Without Mitigation	2	2	3	1	4	32	Moderate	(-)	High
With Mitigation	1	1	3	1	3	18	Low	(-)	High

Potential Impact	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character	Confidence
GENERATION OF DUST AND PM								
Mitigation and Management Measures	— Dust-reducing mitigation measures must be put in place and must be strictly adhered to, for all roads and soil/material stockpiles especially. This includes wetting of exposed soft soil surfaces and not conducting activities during high wind periods which will increase the likelihood of dust being generated; — All stockpiles (if any) must be restricted to designated areas and may not exceed a height of two (2) metres; — Ensure that all vehicles, machines and equipment are adequately maintained to minimise emissions; — It is recommended that the clearing of vegetation from the site should be selective, be kept to the minimum feasible area, and be undertaken just before construction so as to minimise erosion and dust potential; — All materials transported to, or from, site must be transported in such a manner that they do not fly or fall off the vehicle. This may necessitate covering or wetting friable materials. — Enforcing of speed limits. Reducing the dust generated by the listed activities above, putting up signs to enforce speed limit in access roads. — No burning of waste, such as plastic bags, cement bags and litter is permitted; and — All issues/complaints must be recorded in the complaints register.								

1.1.2 OPERATIONAL PHASE

There are no anticipated air quality impacts during the operational phase as maintenance activities will occur as and when required and will be extremely short term.

CUMULATIVE IMPACT ASSESSMENT

Although the BA process is essential to assessing and managing the environmental and social impacts of individual projects, it often may be insufficient for identifying and managing incremental impacts on areas or resources used or directly affected by a given development from other existing, planned, or reasonably defined developments at the time the risks and impacts are identified.

IFC PS 1 recognizes that, in some instances, cumulative effects need to be considered in the identification and management of environmental and social impacts and risks. For private sector management of cumulative impacts, IFC considers good practice to be two pronged:

- effective application of and adherence to the mitigation hierarchy in environmental and social management of the specific contributions by the project to the expected cumulative impacts; and
- best efforts to engage in, enhance, and/or contribute to a multi-stakeholder, collaborative approach to implementing management actions that are beyond the capacity of an individual project proponent.

Even though Performance Standard 1 does not expressly require, or put the sole onus on, private sector clients to undertake a cumulative impact assessment (CIA), in paragraph 11 it states that the impact and risk identification process "*will take into account the findings and conclusions of related and applicable plans, studies, or assessments prepared by relevant government authorities or other parties that are directly related to the project and its area of influence*" including "*master economic development plans, country or regional plans, feasibility studies, alternatives analyses, and cumulative, regional, sectoral, or strategic environmental assessments where relevant*."

Cumulative impacts are those that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones. For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognized as important on the basis of scientific concerns and/or concerns of affected communities (IFC).

Evaluation of potential cumulative impacts is an integral element of an impact assessment. In reference to the scope for an impact assessment, IFC's Performance Standards specify that "*Risks and impacts will be analysed in the context of the project's area of influence. This area of influence encompasses…areas potentially impacted by cumulative impacts from further planned development of the project, any existing project or condition, and other project-related developments that are realistically defined at the time the Social and Environmental Assessment is undertaken; and (iv) areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location."*

A cumulative impact assessment is the process of (a) analysing the potential impacts and risks of proposed developments in the context of the potential effects of other human activities and natural environmental and social external drivers on the chosen Valued Environmental and Social Components (VECs) over time, and (b) proposing concrete measures to avoid, reduce, or mitigate such cumulative impacts and risk to the extent possible (IFC).

Cumulative impacts with existing and planned facilities may occur during construction and operation of the proposed project. While one project may not have a significant negative impact on sensitive resources or receptors, the collective impact of the projects may increase the severity of the potential impacts.

SURROUNDING AREA

The project area and surrounding areas have been earmarked for renewable energy development. The South African government gazetted[6] eight (8) areas earmarked for renewable energy development in South Africa. These areas are known as Renewable Energy Development Zones (REDZ) and this project falls within the Komsberg REDZ. The purpose of the REDZ is to cluster development of renewable energy facilities in order to streamline the grid expansion for South Africa i.e. connect zones to one another as opposed to a wide scatter of projects. It is therefore not surprising that there are a number of environmental authorisations (EA) issued for wind energy facilities (either issued or in process) in the area surrounding the proposed project site. It is important to note that the existence of an approved EA does not directly equate to actual 'development'.

The surrounding projects, except for the Preferred Bidders, are still subject to the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) bidding process or subject to securing an off taker of electricity through an alternative

[6] Government Notice 114 of 16 February 2018

process. Some of the surrounding proposed WEFs secured EAs several years ago but have not obtained Preferred Bidder status and as such have not been developed.

These existing surrounding projects of varying approval status have been detailed in the table and figure below. Given the site's location within the Komsberg REDZ, it is considered to be located within the renewable energy hub that is developing in this focus area.

All specialists must consider the cumulative impact of these projects in their statements / assessments prepared to inform this assessment.

Table 4: Renewable energy applications within 30km of the Karreebosch WEF and Powerline

LABEL	DFFE REFERENCE	PROJECT TITLE	STATUS
1	12/12/20/1782/1/AM5	140MW Rietrug Wind Energy Facility near Sutherland, Northern Cape Province.	Preferred Bidder Round 5
2	12/12/20/1782/2/AM6	140MW Sutherland 1 Wind Energy Facility near Sutherland, Northern Cape and Western Cape Provinces.	Preferred Bidder Round 5
3	12/12/20/1782/3/AM3	140 MW Sutherland 2 Wind Energy Facility near Sutherland, Northern Cape Provinces.	Preferred Bidder Round 5
4	12/12/20/1783/1/AM5	150MW Perdekraal Site 1 Wind Energy Facility, Western Cape Province.	Approved
5	12/12/20/1783/2/AM5	147MW Perdekraal Site 2 Wind Energy Facility, Western Cape Province.	Preferred Bidder Round 4, Operational
6	12/12/20/1988/1/AM6	140MW Roggeveld Phase 1 Wind Farm, North of Matjiesfontein, Northern Cape and Western Cape Provinces.	Preferred Bidder Round 4, Operational
7	12/12/20/2370/1/AM6	140 MW Karusa Wind Energy Facility,Phase 1, Karoo Hoogland Municipality, Northern Cape Province.	Preferred Bidder Round 4, Operational
8	12/12/20/2370/2/AM6	140MW Soetwater Wind Farm Phase 2, Karoo Hoogland Municipality, Northern Cape Province.	Preferred Bidder Round 4, Operational
9	12/12/20/2370/3/AM5	140MW Great Karoo Wind Energy Facility Phase 3, Karoo Hoogland Municipality, Northern Cape Province.	Approved
10	14/1/1/16/3/3/1/2318	310MW Pienaarspoort Wind Energy Facility Phase 1, Witzenberg local Municipality, Western Cape Province.	Approved
11	14/12/16/3/3/1/2441	360MW Pienaarspoort Wind Energy Facility Phase 1, Witzenberg local Municipality, Western Cape Province.	Approved
12	14/12/16/3/3/1/1976/1/AM3	226MW Kudusberg Wind Energy Facility between Matjiesfontein and Sutherland in Western and Northern Cape Provinces.	Approved
13	14/12/16/3/3/1/1115	325WM Rondekop Wind Energy Facility between Matjiesfontein and Sutherland in Western and Northern Cape Provinces	Approved
14	14/12/16/3/3/1/1977/AM3	183MW Rietkloof Wind Energy Facility near Matjiesfontein in the Western Cape Province.	Preferred Bidder Round 5
15	14/12/16/3/3/1/2542	200 MW Esizayo Wind Energy Facility Expansion near Laingsburg, Western Cape.	In Process

16	14/12/16/3/3/2/2009/AM1	Oya Energy Facility	Preferred Bidder Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP)
17	14/12/16/3/3/2/826	140MW Gunsfontein Wind Energy Facility Karoo Hoogland Municipality, Northern Cape Province.	Approved
18	14/12/16/3/3/2/856 /AM4	275MW Komsberg West near Laingsburg, Western Cape Provinces	Approved
19	14/12/16/3/3/2/857/AM4	275 Komsberg East near Laingsburg, Western Cape Provinces.	Approved
20	14/12/16/3/3/2/900/AM2	140MW Brandvalley Wind Energy Facility, WITHIN THE Laingsburg and Witzenberg Local Municipalities in the Western and Northern Cape Province.	Preferred Bidder Round 5
21	14/12/16/3/3/2/962/AM1	140MW Maralla East Wind Energy Facility, Namakwa and Central Karoo District Municipalities, Western and Northern Cape Provinces.	Approved
22	14/12/16/3/3/2/963/AM1	140Maralla West Wind Energy Facility, Karoo Hoogland local Municipality, Northern Cape Province.	Approved
23	14/12/16/3/3/2/967/AM3	140MW Esizayo Wind Farm, Laingsburg Local Municipality Western Cape Province.	Approved
24	12/12/20/2235	10MW Inca Photovoltaic Facility near Sutherland, Northern Cape Province.	Approved

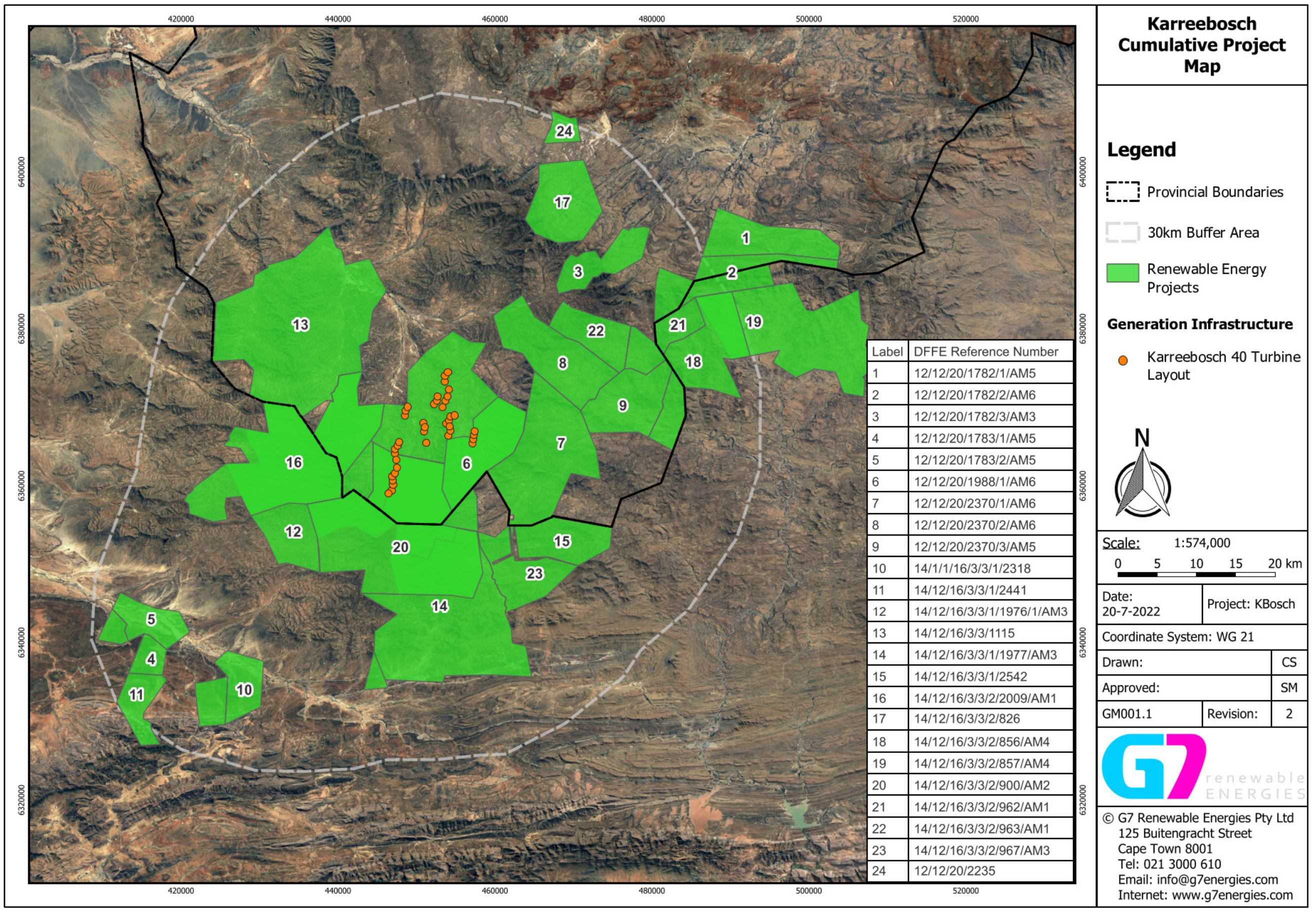

Figure 0-1: Renewable energy projects within a 30km radius of the Karreebosch WEF