Appendix H-9

TRAFFIC STUDY

Confidential

Impumelelo Wind Energy Facility and Associated Infrastructure Transport Impact Assessment (EIA Phase)

January 2023

REVISION 1

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VERIFICATION PAGE	Qual-frm-026 Rev 14

TITLE:

Impumelelo Wind Energy Facility and Associated Infrastructure, Transport Impact Assessment (EIA Phase)

JGA REF. NO.	DATE:	REPORT STATUS
5651_IWEF-EIA	18/01/2023	Second Issue

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SYNOPSIS

Preparation of a Transport Impact Assessment for the proposed development of a 200 MW Wind Energy Facility (i.e., Impumelelo Wind Energy) and associated infrastructure, in the Dipaleseng Local Municipality of the Gert Sibande District Municipality.

KEY WORDS:

Wind Energy Facility, Transport Impact Assessment

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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Verification	Capacity	Name	Signature	Date
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Filename:	https://jgafrika.sharepoint.com/sites/Job5651-team-100-WIP-Internal-Eng/Shared Documents/100-WIP-Internal-Eng/104-Studies/Impumelelo/Impumelelo WEF TIA-EIA phase _18-01-2023.docx

Report template version: 2017-10-30

Impumelelo Wind Energy Facility
Transport Impact Assessment
(EIA Phase)

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EXECUTIVE SUMMARY

This report serves as the Traffic Impact Assessment aimed at determining the traffic impact of the proposed 200MW Impumelelo Wind Energy Facility and associated infrastructure, and whether such a development can be accommodated by the transportation system.

The Impumelelo WEF is proposed to be based in the Dipaleseng Local Municipality in the Mpumalanga Province of South Africa. The site will accommodate up to 28 wind turbines including associated support structures and facilities to allow for the generation and evacuation of electricity.

The site access points have not been finalised at this stage. It is recommended that the site access points meet access spacing requirements and recommended sight distances. The access points also need to be upgraded to accommodate the expected construction and haulage vehicles.

According to the latest Dipaleseng Municipality Spatial Development Framework (2010), non-motorised transportation (NMT) such as walking is the most prevalent form of transportation in the municipality while private cars and minibus/taxis are the second-most used mode of transport (±4%) followed by buses ±3%.

The Dipaleseng Municipality IDP 2021-2022 show that there is no integrated transport plan in place thus there are currently no known future planned public transport facilities in the vicinity of the site.

The highest trip generation for the site is expected during the construction phase. Without mitigation of trips, 41 peak hour trips are estimated for material delivery, and 22 peak hour trips are estimated for construction worker trips. It must however be noted that this is a conservative estimate. The actual construction stage peak hour trips are dependent on the construction period, construction programming, material availability, component delivery, abnormal load permitting etc.
The decommissioning phase is expected to generate similar trips as the construction phase.

During the operation stage it is estimated that 12 peak hour trips will be generated by the wind energy facility. The traffic impact during the operational phase is considered negligible.

For the construction, operational and decommissioning phases, the impact expected to be generated by the vehicle trips is an increase in traffic and the associated noise, dust, and exhaust pollution, which is addressed in Section 7 of this report. Before mitigation measures are considered, the impact is expected to be of a moderate significance rating during the construction and decommissioning stage, and a low significance during the operational stage.
Post mitigation, the impact is expected to be of low significance rating for the construction and decommission phase. During the operational stage a very low significance rating is envisaged.

To assess the cumulative impact, it will be assumed that all authorised and proposed renewable energy projects within the vicinity of the site, would be constructed at the same time. It must be noted that this is a conservative approach. Before mitigation measure are considered, the impact is expected to be of moderate significance rating during the construction and decommissioning stage, and a low significance rating during the operational stage.

Post mitigation, the impact is still expected to be of moderate significance rating for the construction and decommission phase. During the operational stage a low significance rating is still envisaged. Even though the rating categories remain the same post mitigation, the rating values are lower than those expected pre-mitigation.

To limit traffic congestion and the associated noise, dust, and exhaust pollution it is recommended to:

- Stagger the transportation of components to the site to occur outside of peak traffic periods,
- Use dust suppression on gravel roads during the construction phase, as required.
- Use mobile batch plants and quarries near the site, where available and feasible.
- Staff and general trips should occur outside of peak traffic periods as far as possible.
- Shuttle bus services for staff/workers can be considered to limit trips generated by the staff.
- Use on site water sources to limit water truck trips, if available.
- Maintain internal roads to achieve good riding quality.

The No-Go alternative (i.e., proposed development does not proceed) is not considered preferable because the development is expected to introduce socio-economic benefits to the surrounding communities, as well as aid the government in meeting energy demands.

IMPUMELELO WIND ENERGY FACILITY
TRANSPORT IMPACT ASSESSMENT

This report serves as the Traffic Impact Assessment (TIA) that was prepared as part of the Environmental Impact Assessment (EIA) for the proposed development of a 200MW Impumelelo Wind Energy Facility (WEF) and associated infrastructure, based in the Dipaleseng Local Municipality in the Mpumalanga Province of South Africa.

1 INTRODUCTION

1.1 Project Description

The Impumelelo WEF is a proposed 200MW facility (~28 turbines) with a Grid connection up to 132 kV, located over 2800ha. The project is located in the Dipaleseng Local Municipality of the Gert Sibande District Municipality, approximately 19 km north-east of the town of Greylingstad, located in the Mpumalanga Province. (See **Figure 1-1**).

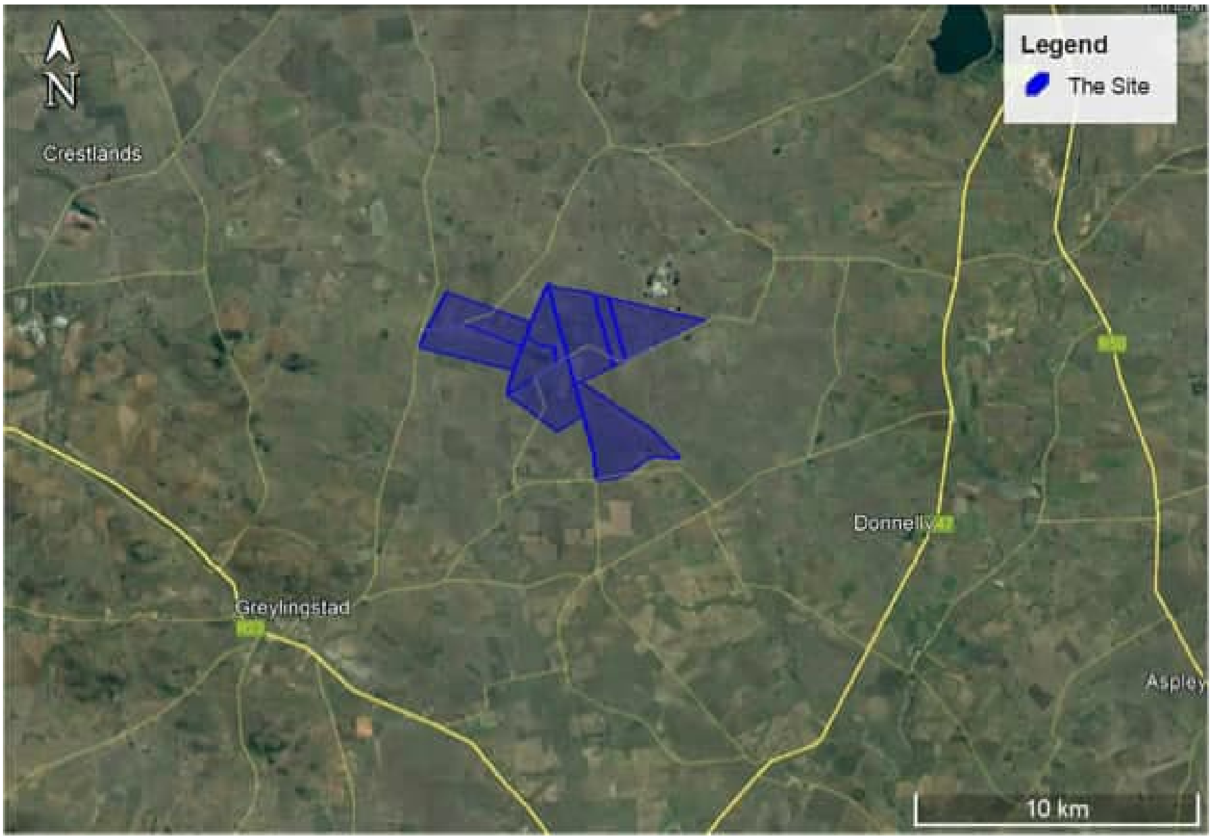


Figure 1-1: Locality map

The proposed Impumelelo WEF and associated infrastructure are subject to a full Scoping and EIA process in terms of the 2014 NEMA EIA Regulations, as amended.

The project WEF area covers nine (9) property portions. The details of the properties associated with the proposed Impumelelo WEF, are outlined in **Table 1-1** and shown in **Figure 1-2.**

Table 1-1: Affected farm properties (WEF)

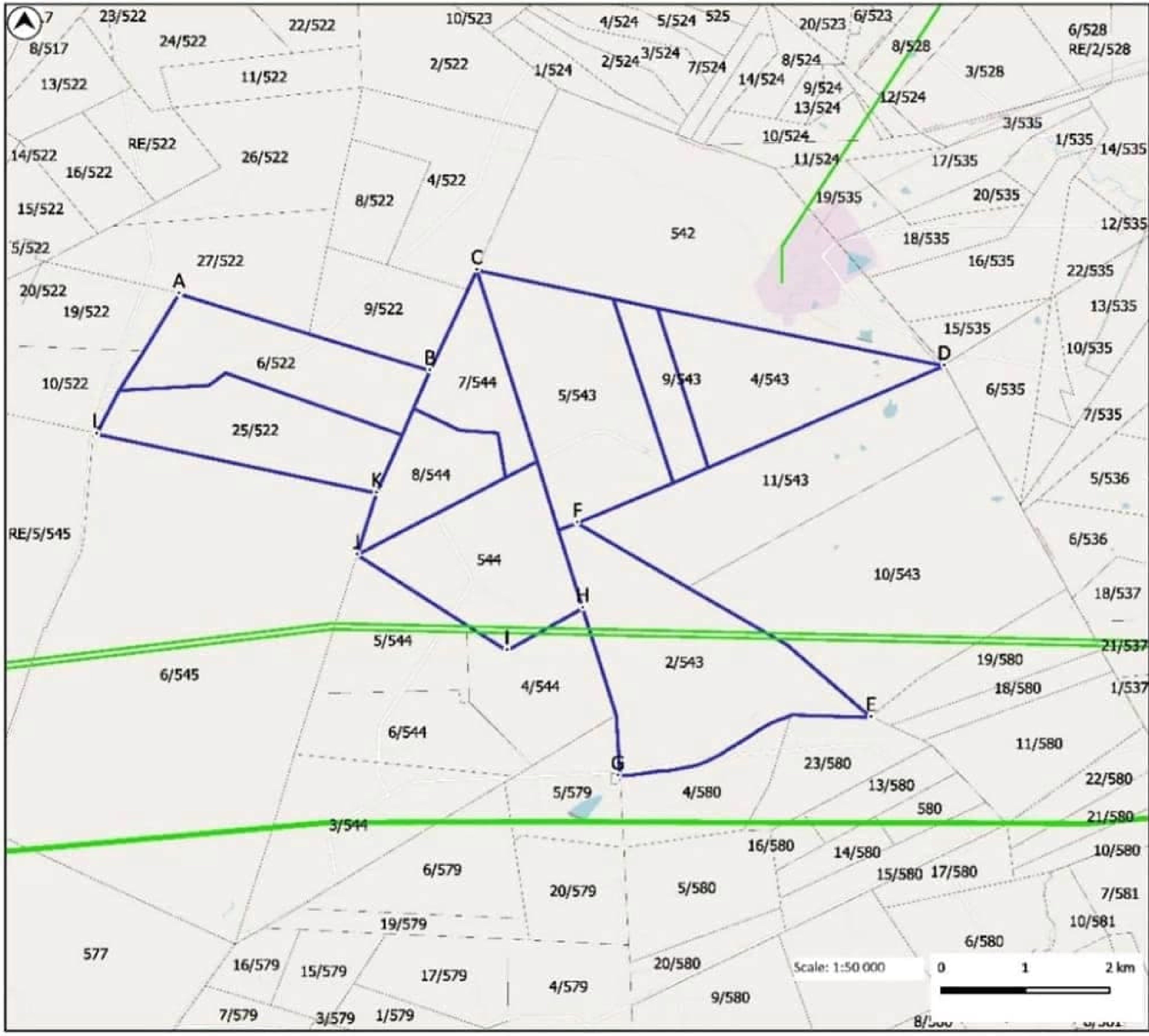
Portion Number	Farm Number	Farm Names
6 & 25	522	Hartbeesfontein
2, 4, 5 and 9	543	Platkop
0, 7 and 8	544	Mahemsfontei

The Impumelelo grid connection up to 132 kV project area covers approximately 49 property portions. The details of the properties associated with the proposed Impumelelo WEF, including the 21-digit Surveyor General (SG) codes for the cadastral land parcels are outlined in the table below:

Table 1-2:Affected farm properties (Gridline)

Portion No.	Farm No.	Farm Name
3	130	Zandfontein
2	130	Zandfontein
5	130	Zandfontein
8	130	Zandfontein
9	130	Zandfontein
0	279	Grootspruit
1	280	De Bank of Vaalbank
2	280	De Bank of Vaalbank
4	280	De Bank of Vaalbank
6	280	De Bank of Vaalbank
2	528	
3	528	Kafferfontein?
9	528	Kaalspruit
6	528	
7	528	Kaalspruit
16	323	Roodebank
0	542	
3	535	
4	535	Holgatsfontein
20	535	Holgatsfontein
18	535	Holgatsfontein
17	535	Holgatsfontein
19	535	Holgatsfontein
16	535	Holgatsfontein

15	535	
14	535	Holgatsfontein
3	535	Holgatsfontein
17	535	Holgatsfontein
0	529	
2	543	Platkop
4	543	Platkop
5	543	Platkop
9	543	Platkop
3	277	Sprinbokdraai
5	277	
2 (8)	277	Sprinbokdraai
5	277	Sprinbokdraai
20	323	Roodebank
3	130	
1	534	Wolvenfontein
18	534	Wolvenfontein
19	534	Wolvenfontein
20	534	Wolvenfontein
16	532	
0	544	Mahemsfontein
7	544	Mahemsfontein
8	544	Mahemsfontein
25	522	Hartbeestfontein
6	522	Hartbeestfontein



Impumelelo Wind Energy Facility (WEF)

Dipaleseng Local Municipality, Mpumalanga Province, South Africa

Legend

- Impumelelo WEF Points
- Eskom Existing Transmission Lines
- Impumelelo WEF
- Farm Portion

Site Boundary Point Coordinates in Hartebeesthoek 1994 Coordinate System

Point	X	Y
A	28.8086747590001	-26.643721434999918
B	28.83869741900014	-26.65321407400001
C	28.844297737000034	-26.64077696100002
D	28.900207829000063	-26.652615733999998
F	28.856302689000017	-26.67207119100248
E	28.891458043000004	-26.696058958002414
G	28.861183949768893	-26.703265425184888
H	28.856962539999984	-26.682578246004994
I	28.847904125000017	-26.68781355100498
J	28.82998218500006	-26.675992276007435
K	28.832299784000043	-26.668328968009913
L	28.798806940893996	-26.661028118897203

Drawing no.:IPO001
Revision: 0
Paper Size: A4
Purpose: permits

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Figure 1-2: Affected farm portions

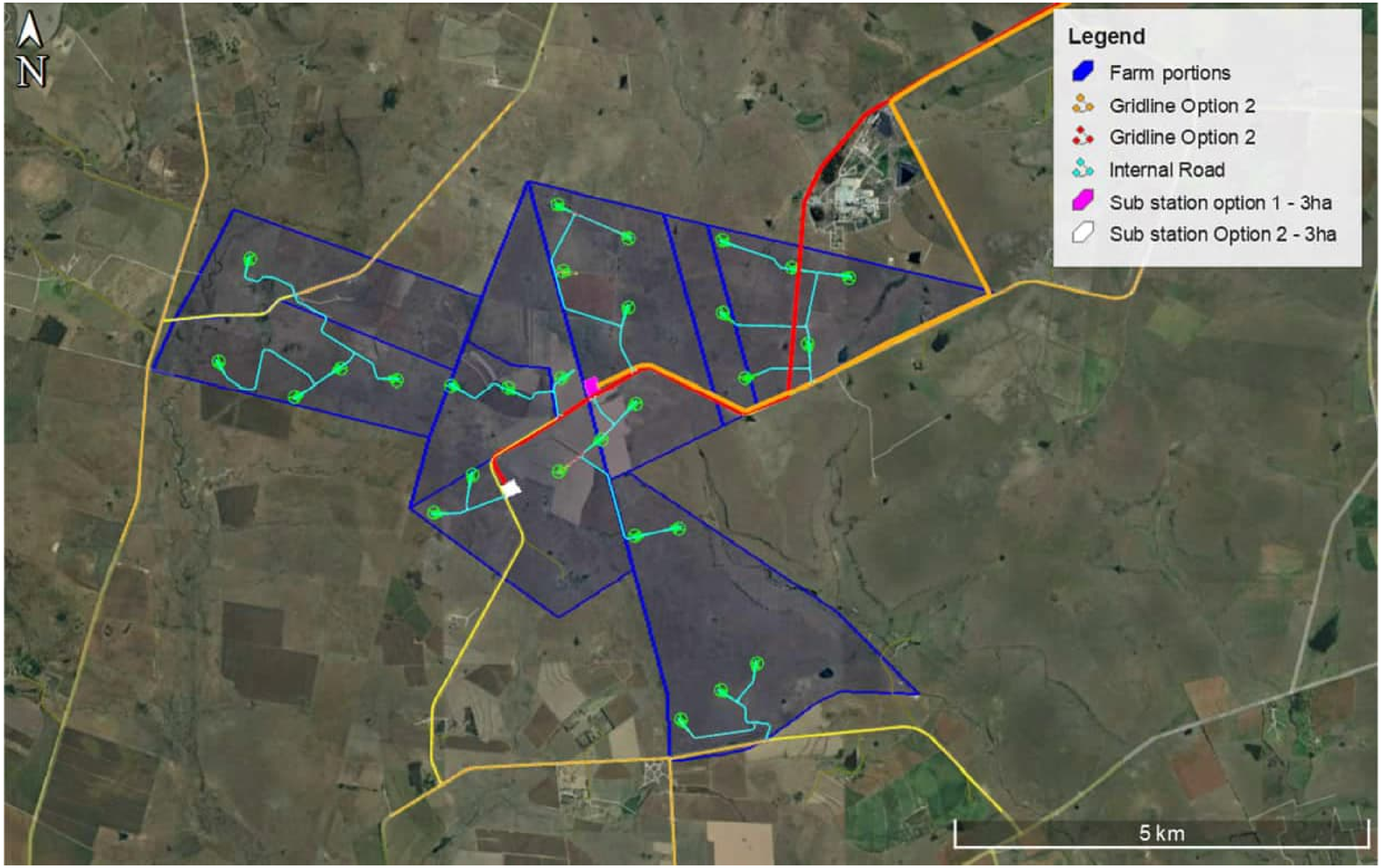

Figure 1-3: Preliminary Layout

1.2 Scope, Purpose, and Objectives of Specialist Report

The TIA is aimed at determining the traffic impact of the proposed land development proposal and whether such development can be accommodated by the external transportation system.
The report deals with the items listed below and focuses on the surrounding road network in the vicinity of the site:

- The proposed development,
- The existing road network and future road planning proposals,
- Trip generation for the proposed development during the construction, operation, and decommissioning phases of the facility,
- Traffic impact of the proposed development,
- Access requirements,
- Determine a main route for the transportation of components to the proposed site,
- Determine a preliminary transportation route for the transportation of materials, equipment, and people to site,
- Recommend alternative or secondary routes where possible.
- Public Transport access,
- Non-motorised Transport facilities, and
- Recommended public transport and NMT upgrades, if necessary.

1.3 Details of Specialist

Adrian Johnson of JG Afrika Pty (Ltd) is the Traffic & Transportation Engineering specialist tasked with providing a Traffic Impact Assessment for the Impumelelo Wind Energy Facility project. Adrian Johnson is registered with the Engineering Council of South Africa (ECSA), with Registration Number 201570274.

In addition, a signed specialist statement of independence is included in **Appendix B** of this specialist assessment.

1.4 Terms of Reference

JG Afrika (Pty) Ltd was appointed by WSP Environment & Energy on behalf of their client ENERTRAG South Africa (Pty) Ltd, to provide a Traffic Impact Assessment to from part of the of the Environmental Impact Assessment for the proposed 200MW Impumelelo Wind Energy Facility.

Impumelelo Wind RF (Pty) Ltd proposes to develop the Impumelelo Wind Energy Facility, with a maximum capacity of up to 200 MW, located in the Dipaleseng local Municipality of the Gert Sibande District Municipality, in the Mpumalanga Province of South Africa.

The proposed Impumelelo WEF and associated infrastructure are summaries in the project information in **Table 1-3** below:

Table 1-3:Project information (WEF)

Facility Name	Impumelelo Wind Energy Facility
Applicant	Impumelelo Wind (Pty) Ltd (Registration Number: 2022/601923/07
Municipalities	The project is located in the Dipaleseng local Municipality of the Gert Sibande District Municipality
Affected Farms[1]	Portions 6 & 25 of the Farm 522 Hartbeesfontein; Portions 2, 4, 5 and 9 of the Farm 543 Platkop; Portions 0, 7 and 8 of the Farm 544 Mahemsfontei
Extent	2800 ha
Buildable area	Approximately 680 ha, subject to finalization based on technical and environmental requirements
Capacity	Up to 200MW
Number of turbines	~28
Turbine hub height:	Up to 200m
Rotor Diameter:	Up to 200m
Foundation	Approximately 25m^2 diameter x 3m deep – 500 – 650m^3 concrete. Excavation approximately 1000m^2, in sandy soils due to access requirements and safe slop stability requirements.
Operations and Maintenance (O&M) building footprint:	Located in close proximity to the substation. Septic tanks with portable toilets Typical areas include: - Operations building – 20m x 10m = 200m^2 - Workshop – 15m x 10m = 150m^2 Stores - 15m x 10m = 150m^2

[1] Based on the current conceptual layout.

Construction camp laydown	Typical area 100m x 50m = 5000m^2. Sewage: Septic tanks and portable toilets
Temporary laydown or staging area:	Typical area 220m x 100m = 22000m². Laydown area could increase to 30000m² for concrete towers, should they be required.
Batching plant (temporary):	Gravel and sand will be stored in separate heaps whilst the cement will be contained in a silo.
Internal Roads:	Width of internal road – Between 5m and 6m. Length of internal road – Approximately 60km. Where required for turning circle/bypass areas, access or internal roads may be up to 20m to allow for larger component transport.
Cables:	The medium voltage collector system will comprise of cables up to and including 33kV that run underground, except where a technical assessment suggest that overhead lines are required, within the facility connecting the turbines to the onsite substation.
Independent Power Producer (IPP) site substation and battery energy storage system (BESS):	Total footprint will be up to 6.5ha in extent (5ha for the BESS and 1.5ha for the IPP portion of the substation). The substation will consist of a high voltage substation yard to allow for multiple (up to) 132kV feeder bays and transformers, control building, telecommunication infrastructure, access roads, and other substation components as required. The associated BESS storage capacity will be up to 200MW/800MWh with up to four hours of storage. It is proposed that Lithium Battery Technologies, such as Lithium Iron Phosphate, Lithium Nickel Manganese Cobalt oxides or Vanadium Redox flow technologies will be considered as the preferred battery technology however the specific technology will only be determined following EPC procurement. The main components of the BESS include the batteries, power conversion system and transformer which will all be stored in various rows of containers.
Site access	R547 and R23
Height of substation fencing	Up to 3 m high Galvanised steel

The Grid line component of this project will be applied for under a Special Purpose Vehicle (SPV), and the Project Applicant is therefore Impumelelo Wind (Pty) Ltd.

Table 1-4:Project information (Gridline)

Facility Name	Impumelelo Wind Energy Facility
Applicant	Impumelelo Wind (Pty) Ltd (Registration Number: 2022/601923/07
Municipalities	The project is located in the Dipaleseng local Municipality of the Gert Sibande District Municipality
Affected Farms2	Refer to **Table 1-2**
Powerline corridor length	Approx.~34km (To be confirmed prior to construction)
Powerline assessment corridors width	500m (250m either side of center line)
Powerline servitude	32m per 132kV powerline **Option 1 (~33km)** **Option 2 (~`34km)**
Powerline pylons:	Monopole or Lattice pylons, or a combination of both where required
Powerline pylon height:	Maximum 40m height
Temporary laydown or staging area:	Typical area 220m x 100m = 22000m². Laydown area could increase to 30000m² for concrete towers, should they be required.
Site access	R547 and R23
Height of substation fencing	Up to 3 m high Galvanised steel

2 APPROACH AND METHODOLOGY

The report deals with the traffic impact on the surrounding road network in the vicinity of the site during the:

- Construction phase;
- Operational phase; and
- Decommissioning phase.

This transport study includes the following tasks:

<u>Project Assessment</u>

- Communication with the project team to gain sound understanding of the project.
- Overview of available project background information including, but not limited to, location maps, site development plans, anticipated vehicles to the site (vehicle type and volume), components to be transported and any resulting abnormal loads.
- Research of all available documentation and information relevant to the proposed facility.

<u>Access and Internal Roads Assessment</u>

- Assessment of the proposed access points including:
  - Feasible location of access points
  - Motorised and non-motorised access requirements
  - Queuing analysis and stacking requirements, if required
  - Access geometry
  - Sight distances and required access spacing
  - Comments on internal circulation requirements and observations

<u>Haulage Route Assessment</u>

- Determination of possible haulage routes to site regarding:
  - National routes
  - Local routes
  - Site access points
  - Road limitations due to abnormal loads

<u>Traffic Estimation and Impact</u>

- Construction, operational, and decommissioning phase vehicle trips
  - Generated vehicles trips
  - Abnormal load trips
  - Access requirements
- Investigation of the impact of the development traffic generated during construction, operation, and decommissioning.

<u>Report (Documentation)</u>

- Reporting on all findings and preparation of the report.

2.1 Information Sources

The following guidelines have been used to determine the extent of the traffic study:

- 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
- Google Earth Pro
- Mpumalanga Road Asset Management System
- Transnet port terminals website
- Dipaleseng Municipality Spatial Development Framework (2010)
- Dipaleseng Municipality IDP 2021-2022

2.2 Assumptions, Knowledge Gaps and Limitations

The following assumptions and limitations apply:

- This study is based on the project information provided by the client.
- According to the Eskom Specifications for Power Transformers (Eskom Power Series, Volume 5: Theory, Design, Maintenance and Life Management of Power Transformers), the following dimensional limitations need to be kept when transporting the transformer – total maximum height 5 000mm, total maximum width 4 300mm and total maximum length 10 500mm.
  It is envisaged that for this project, the inverter, transformer, and switchgear will be transported to site in containers on a low bed truck and trailer. A mobile crane and the transformer transport are the only abnormal load envisaged for the site. The crane will be utilised for offloading equipment, such as the transformers.
- Maximum vertical height clearances along the haulage route are 5.2m for abnormal loads.
- If any elements are manufactured within South Africa, these will be transported from their respective manufacturing centres, which would be either in the greater Cape Town area, Johannesburg, or possibly Pinetown/Durban.
- All haulage trips will occur on either surfaced national and provincial roads or existing gravel roads.
- Material for the construction of internal access roads will be sourced locally as far as possible.
- The maximum number of turbines to be used at the site is estimated to be 28.
- The final access points are to be determined during the detailed design stage. Only recommended access points are known at this stage.
- Projects in the vicinity of the site to be considered as part of the EIA cumulative impacts are currently unknown.
- An 18-to-24-month construction period is assumed with 48% of the construction period dedicated to site prep and civil works.

- The Proposed project also comprises of a 33/132 kV on-site Substation with the following Grid Connection solutions:
  - Alternatively, constructing a ~30km overhead line from the onsite switching station to Zandfontein substation and constructing a feeder bay at Zandfontein substation.
  - A 500m corridor along each of the proposed options (250m from the centre lines) are included in the assessments.
- The Access locations for the site have not been finalised at this stage. General guidelines are thereof provided in this report to aid the design team in determining the best access locations for the site.

2.3 Consultation Processes Undertaken

The TIA is based on available project information and consultation with the Environmental Practitioner assigned to the project.

3 LEGISLATIVE AND PERMIT REQUIREMENTS

Key legal requirements pertaining to the transport requirements for the proposed development are:

- Abnormal load permits, (Section 81 of the National Road Traffic Act 93 of 1996 and National Road Traffic Regulations, 2000),
- Port permit (Guidelines for Agreements, Licenses and Permits in terms of the National Ports Act No. 12 of 2005), and
- Authorisation from Road Authorities to modify the road reserve to accommodate turning movements of abnormal loads at intersections.

4 DESCRIPTION OF PROJECT ASPECTS RELEVANT TO THE TIA

4.1 Port of Entry

It is envisaged that the components will be imported to South Africa via the Port of Durban or the Port of Richards Bay as the closest ports to the site.

4.1.1 The Port of Durban

The Durban container terminal operates as two terminals Pier 1 and Pier 2, handling 65% of South Africa’s container volumes. It is ideally located to serve as a hub for containerized cargo from the Indian Ocean Islands, Middle East, Far East and Australia.

The Durban Container Terminal is Africa's biggest and busiest - home to the state of the art, twin lift ship-to-shore cranes. Various capacity creation projects are currently underway, including deepening of berths and operational optimization. The terminal currently handles 65% of South Africa's container volumes. (Transnet Port Terminals, n.d.)

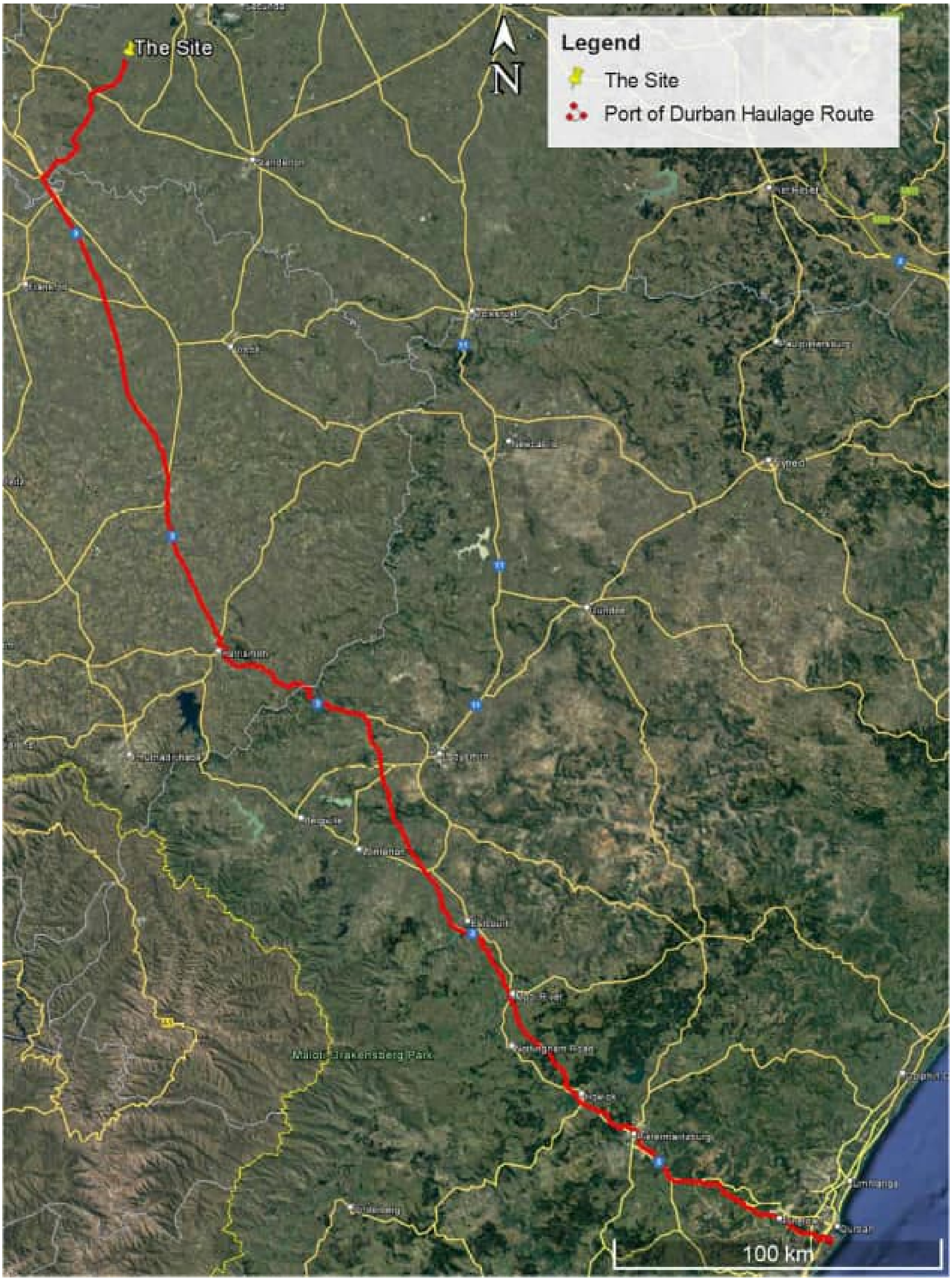

Figure 4-1: Route from the site to the Port of Durban

4.1.2 The Port of Richards Bay

The Port of Richards Bay is situated in the northern industrial hub of Kwa-Zulu Natal and accessible via rail and road. The port is a deep-sea water port with 13 berths. The Port can handle dry bulk ores, minerals and break bulk with a draft that easily accommodates Cape size and Panamax vessels.

The Port is currently creating capacity, investing in new equipment, and undergoing extensive refurbishments. The Richards Bay port will not only be a deep-sea water port, but South Africa's premium bulk mineral port within the next six years. The Richards Bay Expansion Programme is currently in progress, adding new berths and extending rail capacity within the port. (Transnet Port Terminals, n.d.)

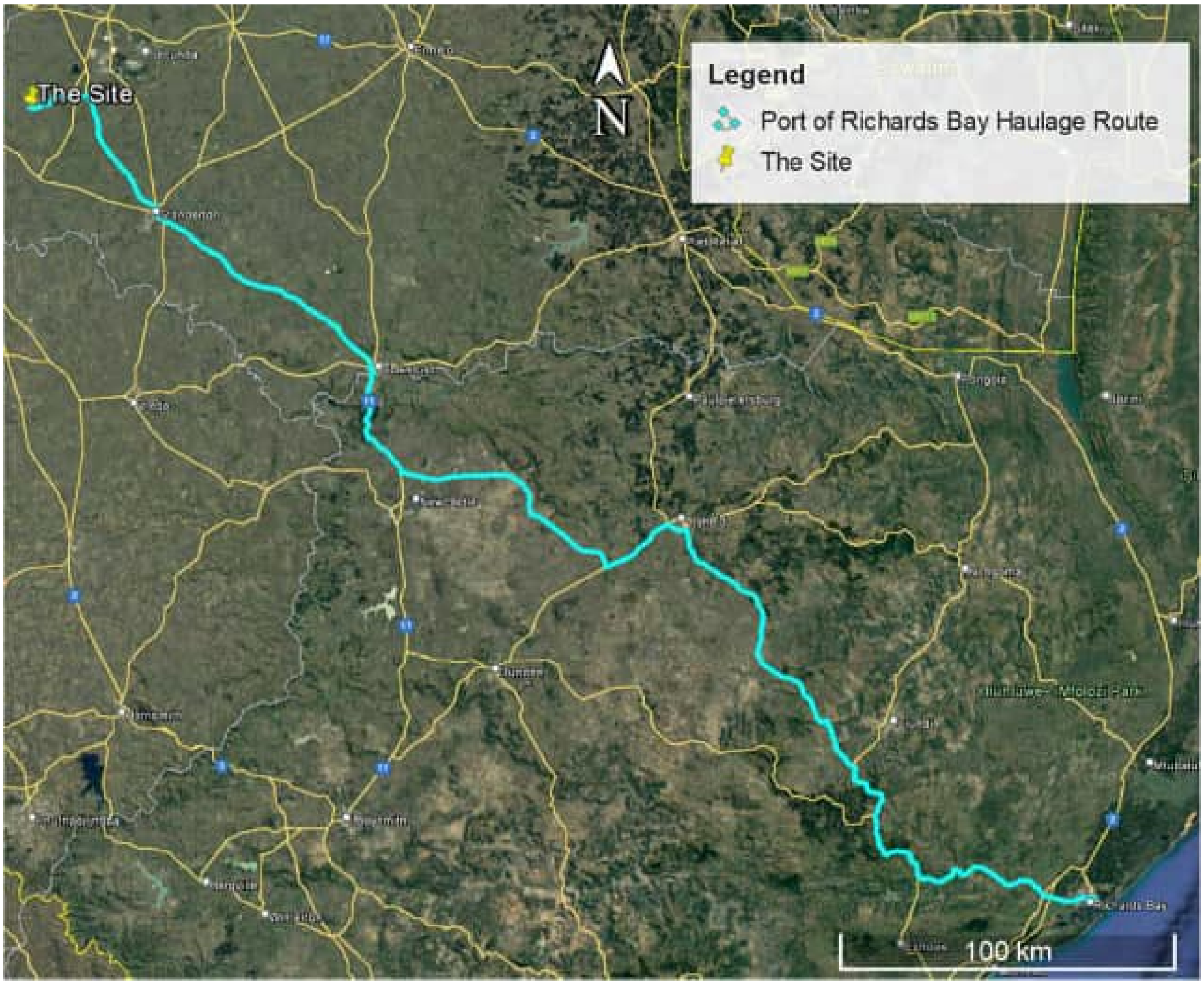

Figure 4-2: Route from the site to the Port of Richards Bay

The Port of Durban is located approximately 513km south-east of the site (see **Figure 4-1**), and the Port of Richards Bay is located approximately 504km south-east of the site (see **Figure 4-2**). The travel routes to the site from the ports comprise mostly high order routes. It is, however, recommended to conduct a "dry run" with abnormal transport vehicles to determine the route limitations. Adjustments to the road width (e.g., at bellmouths) and road furniture may be required to accommodate the abnormal load vehicles.

Due to the short travel distance to site, the Port of Richards Bay is considered the preferred port of entry. It must however be noted that the availability at any of the considered ports will need to be confirmed with the Transnet Port authority. Deliveries may also be subject to delays /waiting periods at the port due to backlogs.

4.2 Transportation requirements

It is anticipated that the following vehicles will access the site during construction:

Wind Energy Component:

- Conventional trucks within the freight limitations to transport building material to the site,
- Light vehicles and buses transporting workers from surrounding areas to site,
- Drilling machines and other required construction machinery being transported by conventional trucks or via self-drive to site, and
- Nacelle transported by abnormal load,
- Turbine blades transported by abnormal load,
- Tower sections transported by abnormal load,
- Turbine hub and rotary units by abnormal load,
- Abnormal mobile crane for assembly on site, and
- The transformer transported in an abnormal load (on-site substation).

Grid/power Line:

- Conventional trucks within the freight limitations to transport building material to the site,
- Light vehicles and buses transporting workers from surrounding areas to site,
- Drilling machines and other required construction machinery being transported by conventional trucks or via self-drive to site, and
- The transformer transported in an abnormal load,
- Abnormal mobile crane for assembly on site,
- Transmission tower sections transported by abnormal load.

4.3 Abnormal Load Considerations

Abnormal permits are required for vehicles exceeding the following permissible maximum dimensions on road freight transport in terms of the Road Traffic Act (Act No. 93 of 1996) and the National Road Traffic Regulations, 2000:

- Length: 22m for an interlink, 18.5m for truck and trailer and 13.5m for a single unit truck
- Width: 2.6mHeight: 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
- Axle load limitation: 7.7t on the front axle and 9t on the single or rear axles

Any dimension / mass outside 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.

In addition to the above, the preferred routes for abnormal load travel should be surveyed prior to construction to identify any problem areas, e.g., intersections with limited turning radii and sections of the road with sharp horizontal curves or steep gradients, that may require modification. After the road modifications have been implemented, it is recommended to undertake a “dry-run” with the largest abnormal load vehicle, to ensure that the vehicle can travel without disruptions. It needs to be ensured that gravel sections (if any) of the haulage routes remain in good condition and will need to be maintained during the additional loading of the construction phase and reinstated after construction is completed.

There are bridges and culverts along the National and Provincial routes, which need to be confirmed for load bearing capacity and height clearances. However, there are alternative routes which can be investigated if the selected route or sections of the route should not be feasible.

Any low hanging overhead lines (lower than 5.1m), e.g., Eskom and Telkom lines, along the proposed routes will have to be moved to accommodate the abnormal load vehicles.

The expected abnormal load trip generators are for the transport of the transformer, nacelles, turbine blades, tower sections, and turbine hub and rotary units, as well as the abnormal mobile crane needed for assembly on site.

4.4 Further Guideline Documentation

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” outlines the rules and conditions that apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts.

The general conditions, limitations and escort requirements for abnormally dimensioned loads and vehicles are also discussed and 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 the granting of permits for all other exemptions from the requirements of the Road Traffic Act and the relevant regulations.

4.5 Permitting – General Rules

In general, the limits recommended in TRH 11 are intended to serve as a guide to the Permit Issuing Authorities. It must be noted that each Administration has the right to refuse a permit application or to modify the conditions under which a permit is granted. It is understood that:

a) A permit is issued at the sole discretion of the Issuing Authority. The permit may be refused because of the condition of the road, the culverts and bridges, the nature of other traffic on the road, abnormally heavy traffic during certain periods or for any other reason.
b) A permit can be withdrawn if the vehicle upon inspection is found in any way not fit to be operated.
c) During certain periods, such as school holidays or long weekends an embargo may be placed on the issuing or permits. Embargo lists are compiled annually and are obtainable from the Issuing Authorities.

4.6 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 capacity of the vehicles 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.

4.7 Dimensional Limitations

A load of abnormal dimensions may cause an obstruction and danger to other traffic. For this reason, all loads must, as far as possible, conform to the legal dimensions. Permits will only be considered for indivisible loads, i.e., loads that cannot, without disproportionate effort, expense, or risk of damage, be divided into two or more loads for the purpose of transport on public roads. For each of the characteristics below there is a legally permissible limit and what is allowed under permit:

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

4.8 Transporting Wind Turbine Components

Wind turbine components can be transported in several ways with different truck/trailer combinations and configurations. The travel arrangements and logistics will be investigated when the transporting contractor and the plant hire companies apply for the necessary permits from the Permit Issuing Authorities.

4.8.1 Nacelle

The heaviest component of a wind turbine is the nacelle (i.e., approximately 100 tons depending on the manufacturer and design of the unit). Combined with road-based transport, a total vehicle mass of approximately 145 000kg for a 100-ton unit can be expected. Based on the weight limitations, route clearances and permits will be required for transporting the nacelle by road-based transport (see an example of road-based transportation below). The unit will require a minimum height clearance of 5.1 metres.

Figure 4-3:Transporting the Nacelle (Dvorak, 2010)

4.8.2 Blades

A wind turbine's blades are the longest and most vulnerable components and must be protected during shipment. Manufacturers are actively improving on blade designs with blade lengths that go beyond 100m. Blades need to be transported on an extendible blade transport trailer or in a rigid container with rear steerable dollies. Blades can be transported individually, in pairs, or threes, although different manufacturers have different packaging methods for transporting the blades. The transport vehicle typically exceeds the dimensional limitation (length) of 22 metres and will only be allowed under permit, provided the trailer is fitted with steerable rear axles or dollies.

Figure 4-4: Blade transport (Froese, 2019)

For this study, turbine blades of a maximum length of 100 metres have been assessed. Due to this abnormal length, special attention needs to be given to route planning, especially to suitable turning radii and adequate sweep clearance. Therefore, vegetation or road signage may have to be removed before transport. Once transported to the site, the blades need to be carefully stored in their respective laydown areas before being installed onto the rotary hub.

4.8.3 Tower Sections

Tower sections generally consist of sections of around 20 metres in length. The number of tower sections required depends on the selected hub height and type of tower section (i.e., tubular steel, hybrid steel/concrete tower, etc.). For a hub height of 200 metres, a maximum of 10 tower sections is required. Each tower section is transported separately on a low-bed trailer. Depending on the trailer configuration and height when loaded, some of these components may not meet the dimensional limitations (height and width) but will be permitted under certain permit conditions.

Figure 4-5:Transporting the Tower Sections (Montiea, 2014)

4.8.4 Turbine Hub and Rotary Units

The turbine hub needs to be transported separately due to its significant weight. A hub unit weighs around 45 tons.

Figure 4-6:Transporting the rotor hub (Richardstransport, n.d.)

4.9 Transporting Cranes, Mobile Cranes, and other Components

Crane technology has developed rapidly, and several different heavy lifting options are available on the market. Costs involved to hire cranes tend to vary and should be compared beforehand. For this assessment, some possible crane options are outlined as follows.

4.9.1 Examples of Cranes for Assembly and Erection on Site

Option 1: Crawler Crane and Assembly Crane

The main lift crane capable of performing the required lifts (i.e., lifting the tower sections into position, lifting the nacelle to the hub height, and lifting the rotor and blades into place) needs to be similar to the Liebherr Crawler Crane LR1750 with an SL8HS (Main Boom and Auxiliary Jib) configuration. A smaller 200-ton Liebherr Mobile Crane LTM 1200-5.1 is also required to lift the components and assist in the assembly of the crawler crane at each turbine location.

- **Crawler Crane LR1750 with the SL8HS boom system (Main Lifting Crane):**

The Crawler Crane will be transported to the site in components and the heaviest load will be the superstructure and crawler centre section (83 tons). The gross combination mass (truck, trailer, and load) will be approximately 133 000 kg. The boom sections, counterweights and other equipment will be transported on conventional tri-axle trailers and then assembled on site. It will require several truckloads of components to be delivered for assembly of the Crawler Crane before it can be mobilised to perform the heavy lifts.

Figure 4-7: Crawler Crane used to assemble turbine (Liebherr, 2017)

- **Mobile Crane LTM 1200-5.1 (Assembly Crane):**

The Liebherr LTM 1200-5.1 crane is a 5-axle vehicle with rubber tyres, which will travel to site on its own. However, the counterweights will be transported on conventional tri-axle trailers and then assembled on site. The assembly crane is required to assemble the main lift crane as well as assist in the installation of the wind turbine components.

Option 2: GTK 1100 Crane & Assembly Crane

For the single wind turbine at Coega, the GTK 1100 hydraulic crane was used (see example in Figure 3 6). The GTK 1100 was designed to lift ultra-heavy loads to extreme heights and its potential lies in being deployed on facilities such as wind farms.

Figure 4-8: Cranes at work

- **Hydraulic GTK 1100 Crane**

A key benefit of the GTK 1100 is its quick set-up due to the vertical rigging of the self-erecting tower and it can be operational in four to six hours. The crane has a small footprint of 18x18m (including the boom set-up) for a restricted job site area and its self-levelling function results in minimal ground preparation. In addition, the crane can operate at these heights with very heavy loads of up to 100 tons without a counterweight. The GTK 1100 can be transported on four truckloads including two abnormal trailers (for the Boom and Crane).

- **Mobile Crane LTM 1200-5.1 (Assembly Crane):**

As above - a smaller 200-ton Liebherr Mobile Crane LTM 1200-5.1 is also required to lift the components and assist in the assembly of the hydraulic crane at each turbine location.

4.9.2 Cranes at the Port of Entry

Most shipping vessels importing the turbine components will be equipped with on-board cranes to do all the safe off-loading of the wind turbine components to the abnormal transport vehicles, parked adjacent to the shipping vessels.

Figure 4-9: Cranes at Port of Entry

The imported turbine components may be transported from the Port of Entry to the nearby turbine laydown area. Mobile cranes will be required at these turbine laydown areas to position the respective components at their temporary storage location.

4.10 Transporting Other Plant, Material and Equipment

In addition to transporting the specialised equipment, the normal Civil Engineering construction materials, plant and equipment will need to be transported to the site (e.g., sand, stone, cement, gravel, water, compaction equipment, concrete mixers, etc.). Other components, such as electrical cables, battery energy storage compartments, pylons, transformers, and switchgear, will also be transported to site during construction. The transport of these items will be conducted with normal heavy loads vehicles.

5 BASELINE ENVIRONMENTAL DESCRIPTION

5.1 General Description

The site is located in farm property at the Dipaleseng Local Municipality which forms part of the Gert Sibande District Municipality, Mpumalanga (see **Figure 5-1**). The site is located to the north-east of Greylingstad on farm parcels:

- 6 and 25 of the Farm 522 Hartbeesfontein;
- Portions Number 2,4,5 and 9 of the Farm 543 Platkop; and
- Portions Number 0,7 and 8 of the Farm 544 Mahemsfontein.

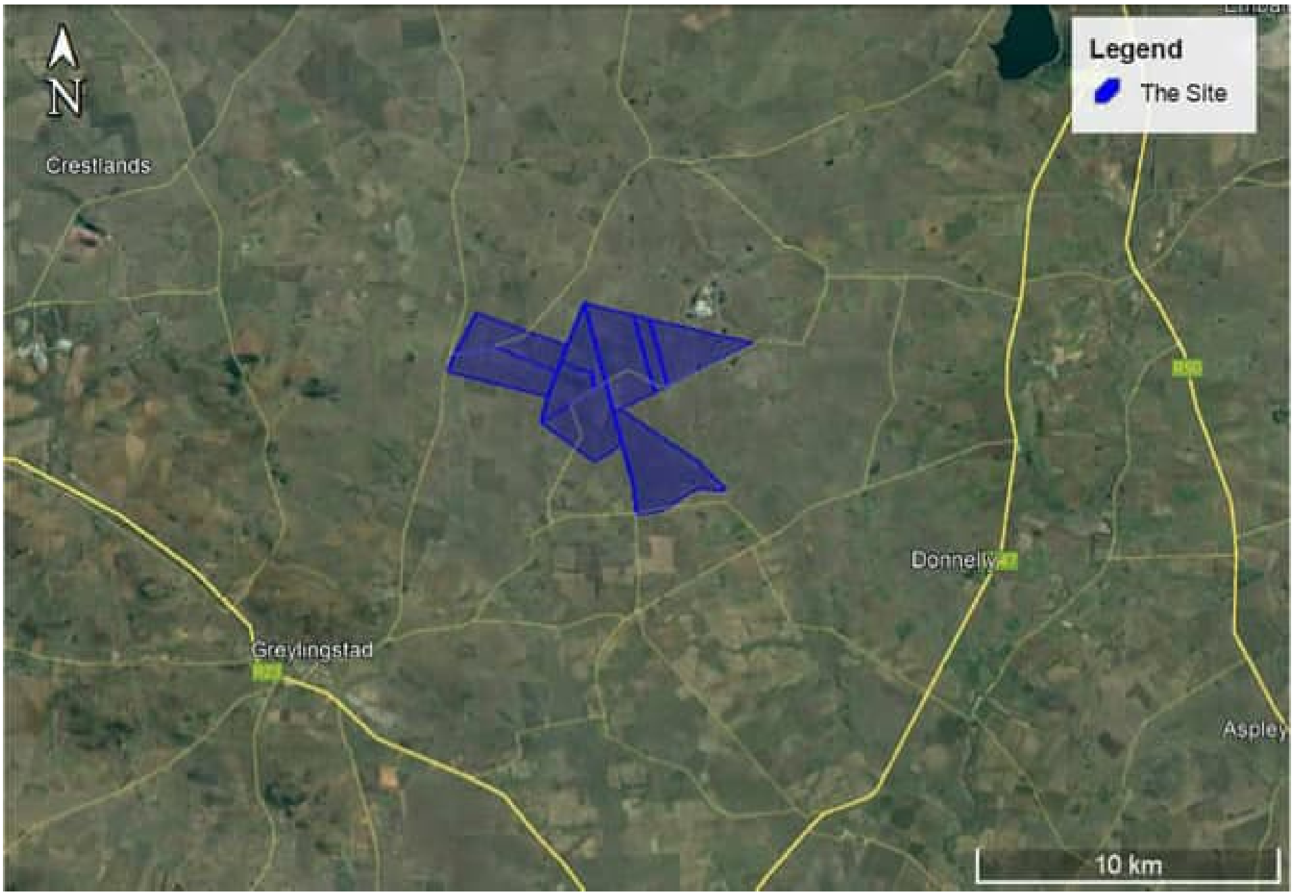

Figure 5-1: The Proposed Site

5.2 Project Specific Description

5.2.1 Route for Components manufactured within South Africa

In South Africa, more than half (52%) of the manufacturing industry's national workforce resides in three metros - Johannesburg, Cape Town, and eThekwini. It is therefore anticipated that elements that can be manufactured within South Africa will be transported to the site from the Cape Town, Johannesburg, or Pinetown/Durban areas. Components will be transported to site using appropriate National and Provincial routes. It is expected that the components will generally be transported to site with normal heavy load vehicles.

1. Route from Cape Town Area to Site – Locally sourced materials and equipment

Cape Town has a large manufacturing sector with 26 industrial areas located throughout the metro.

The proposed industrial hubs being considered to source the required materials and components is currently unknown. With quite an extensive and widespread industrial market, a specific route to the site cannot be considered at this point in time, but it is expected that a majority of the route length will be similar to the routes considered for the haulage of imported materials and equipment. No road limitations are envisaged along the route for normal load freight.

2. Route from Johannesburg Area to Site – Locally sourced materials and equipment

If components from Johannesburg are considered, normal loads from Johannesburg to the site can be transported via the route as shown in **Figure 5-2** below. No road limitations are envisaged along the route for normal load freight. The distance from Johannesburg to the site is approximately 121km.

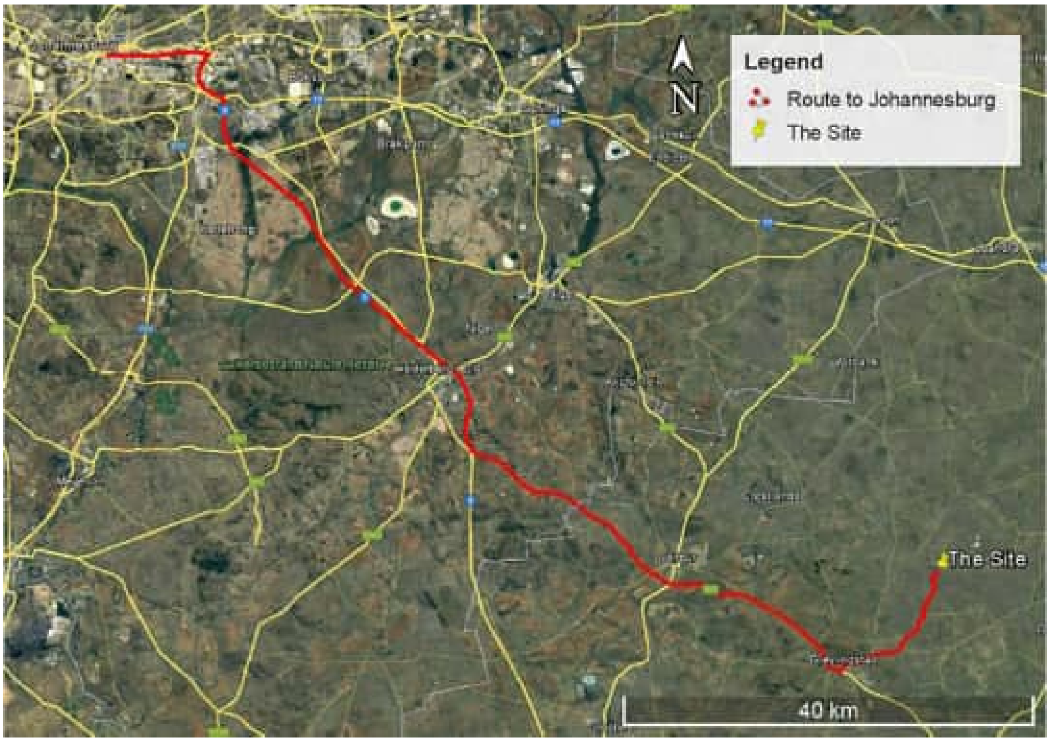

Figure 5-2:Route from Johannesburg Area to Site

3. Route from Pinetown / Durban to Site - Locally sourced materials and equipment

Normal loads can transport elements via two potential routes from Durban and Pinetown to the site. No road limitations are envisaged along the route for normal load freight. The shortest distance from Pinetown to the site is approximately 492km as shown in **Figure 5-3** below.

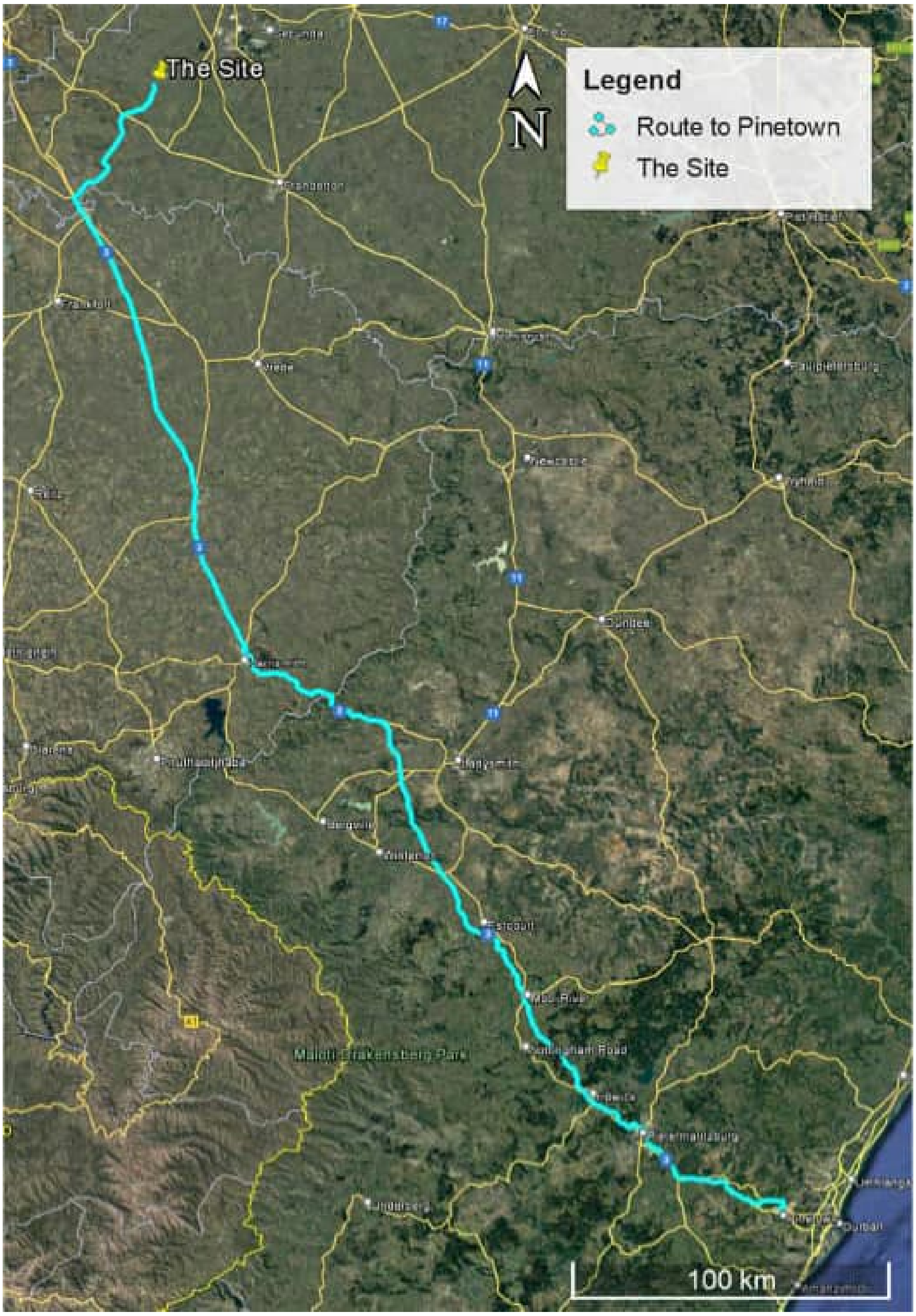

Figure 5-3:Route from Pinetown to the Site

5.2.2 Surrounding road network

The proposed Impumelelo site is located near Secunda, Mpumalanga Province. The road classification of the surrounding road network as per the Road Infrastructure Strategic Framework for South Africa (RISFSA) is shown in **Figure 5-4** below (sourced from Mpumalanga RAMS system).

Rural Class 3 routes are minor arterial roads that typically carry inter-district traffic between: small towns, villages and larger rural settlements; smaller commercial areas and transport nodes of local importance that generate relatively high volumes of freight and other traffic in the district (public transport and freight terminals, railway sidings, small seaports and landing strips);Very small or minor border posts; tourist destinations; Other Class 1, 2 and 3 routes; and smaller centres than the above when travel distances are relatively long (longer than 50 to 100 km).

Rural Class 4 routes are collector roads that form links to local destinations. Class 4 routes do not carry through traffic but only carry traffic with an origin or destination along or near the road.

Class 4 rural routes typically give access to smaller rural settlements, tourist areas, mines, game and nature parks and heritage sites. The roads can also provide direct access to large farms. Collector roads can also be provided within larger rural settlements to provide a collector function in such settlements.

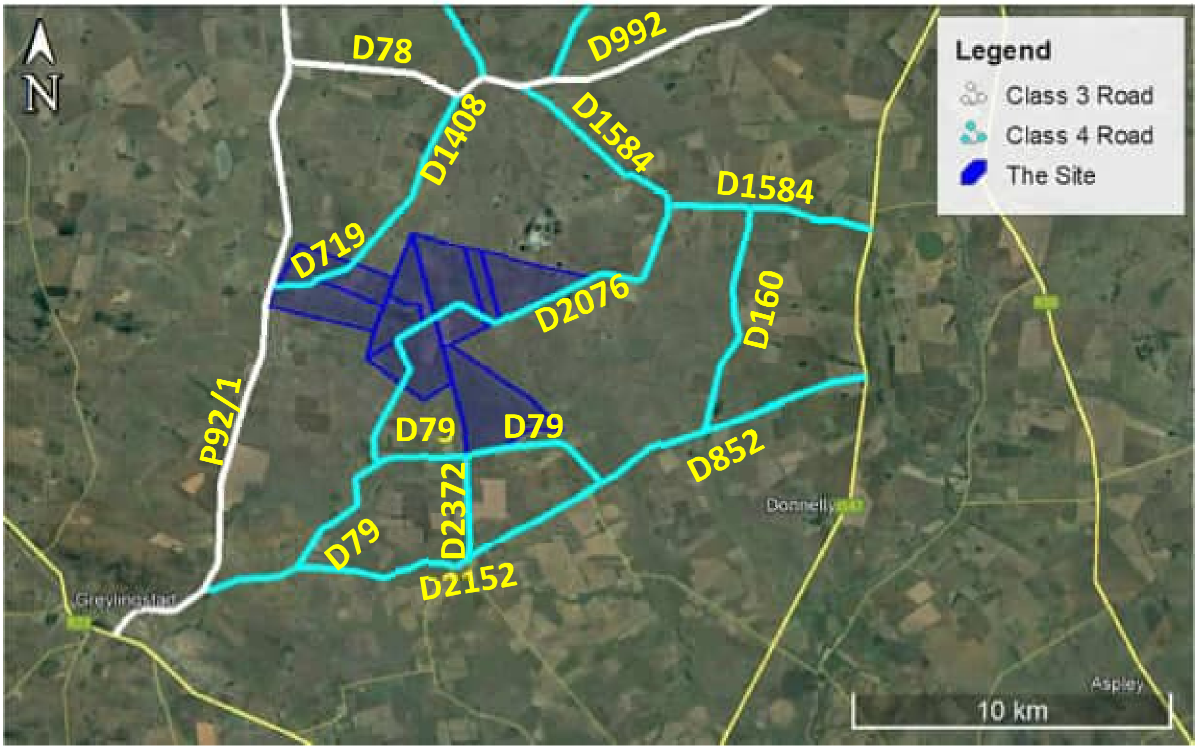

Figure 5-4:Road Classification of surrounding road network

5.3 Access requirements

The access locations for the site have not been finalised at this stage. The following general guidelines are provided to aid the design team in determining the best access locations for the site.

5.3.1 Access location

When considering the location of a sight access points, the following considerations are recommended:

- Traffic safety:
  Traffic safety on roads requires appropriate access spacing to minimise vehicle conflict points and promote the mobility function of the route.

  It is recommended that appropriate signage and markings are provided to alert road users of access points ahead. The road reserve needs to be maintained to prevent obstructions to sight lines. Additionally, road upgrades may be required along existing access roads to accommodate expected vehicles.

  All road markings and signage need to be in accordance with the South African Road Traffic Signs Manual (SARTSM).

- Mobility and access requirements:
  In rural areas, the traffic safety and mobility considerations dictate access spacing requirements, and these are considerably longer than urban requirements. It must however be noted that in some instances, access spacing recommendations may not be feasible due to site boundaries and land terrain limitations.

  Based on TRH26, it is recommended that the access spacing along class 4 roads in a rural environment range from 600-800m. The longest viable distance within that access spacing range should be considered the preferred access spacing length.

  Staggered intersections should be avoided as much as possible because they often do not meet access spacing requirements.

  He use of existing access points is often preferable as access spacing restrictions are often not considered for existing approved access points.

- To allow sufficient decision and reaction time:
  The access should allow visibility as prescribed by road design guidelines for the design speed. To maintain sight lines, sight triangles should be kept clear of obstructions, including street furniture and landscaping elements. However, objects less than 0.6m in height, such as street signs, may be placed in the triangle.

5.3.2 Stacking distance

Site access points to facilities often control access to the site by form of a gate or boom. To mitigate the impact of the vehicles waiting to access the site on the external road network, it is recommended to accommodate a stacking distance/queue length at the access. Queue length is the access road length between the access control and the road edge of the external connecting road.

A site of this nature typically accommodates a minimum 12m stacking distance (i.e., two passenger vehicles). It is however anticipated that larger abnormal loads will visit the site during the construction stage. A traffic management plan can be used to minimise the impacts of such vehicles on the surrounding road network. For example, abnormal load vehicle access can be scheduled such that the access is fully open with no access control in place during abnormal load delivery.

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.

All road markings and signage need to be in accordance with the South African Road Traffic Signs Manual (SARTSM).

5.3.3 Traffic volume information

Based on the Mpumalanga Road Asset Management System most of the surrounding road network is at a low AADT or low- medium AADT. Sections of the D1587 road are at a very high AADT (i.e., poor level of service) and the rest of the route section is at a medium AADT (fair level of service). The D160 road is also at a medium AADT (see **Table 5-1**).

It is recommended that traffic congestion mitigation measures be implemented during the construction and decommissioning stage to limit the impact of the development trips on the surrounding road network.

Table 5-1: 2022 Estimated AADT

Road No#	from_km	to_km	Surface	Link AADT	Volume category
P92/1+	0	0.2	flexible	490	Low-Medium
P92/1+	0.2	3.4	flexible	474	Low-Medium
P92/1+	3.4	3.68	flexible	49	Low
P92/1+	3.68	13.08	gravel	49	Low
P92/1+	13.08	18.1	gravel	49	Low
P92/1+	18.1	19.9	gravel	37	Low
P92/1+	19.9	20.33	gravel	44	Low
P92/1+	20.33	25.6	gravel	51	Low-Medium
P92/1+	25.6	29.21	gravel	45	Low
P92/1+	29.21	37.92	gravel	52	Low-Medium
D1408+	0	0.99	gravel	59	Low-Medium
D1408+	0.99	1.8	gravel	54	Low-Medium
D1584+	0	3.89	flexible	1436	Medium
D1584+	3.89	6.36	flexible	1106	Medium
D1584+	6.36	12.38	gravel	1007	Very High
D160+	0	7.27	gravel	156	Medium
D2076+	0	15.22	gravel	52	Low-Medium
D2372+	0	3.29	gravel	31	Low
D719+	0	7.32	gravel	48	Low
D79+	0	4.78	gravel	7	Low
D79+	4.78	7.58	gravel	28	Low
D79+	7.58	11.98	gravel	38	Low
D852+	0	5.33	gravel	23	Low
D852+	5.33	9.04	gravel	41	Low
D852+	9.04	9.44	gravel	47	Low
D852+	9.44	13.67	gravel	32	Low
D852+	13.67	13.9	gravel	83	Low-Medium
D852+	13.9	14.29	gravel	83	Low-Medium
D852+	14.29	17.79	gravel	66	Low-Medium
D852+	17.79	23.66	gravel	73	Low-Medium

(Source: Mpumalanga Provincial Road Asset Management System (RAMS), n.d.)

The estimated annual traffic growth is as summaries in **Table 5-2** below. This is based on historical AADT data obtained from Mpumalanga RAMS system.

Table 5-2: Estimated traffic growth rates

Light vehicles	Heavy vehicles	Very heavy vehicles	Taxi's	Bus's
0.04	0.05	0.05	0.03	0.05

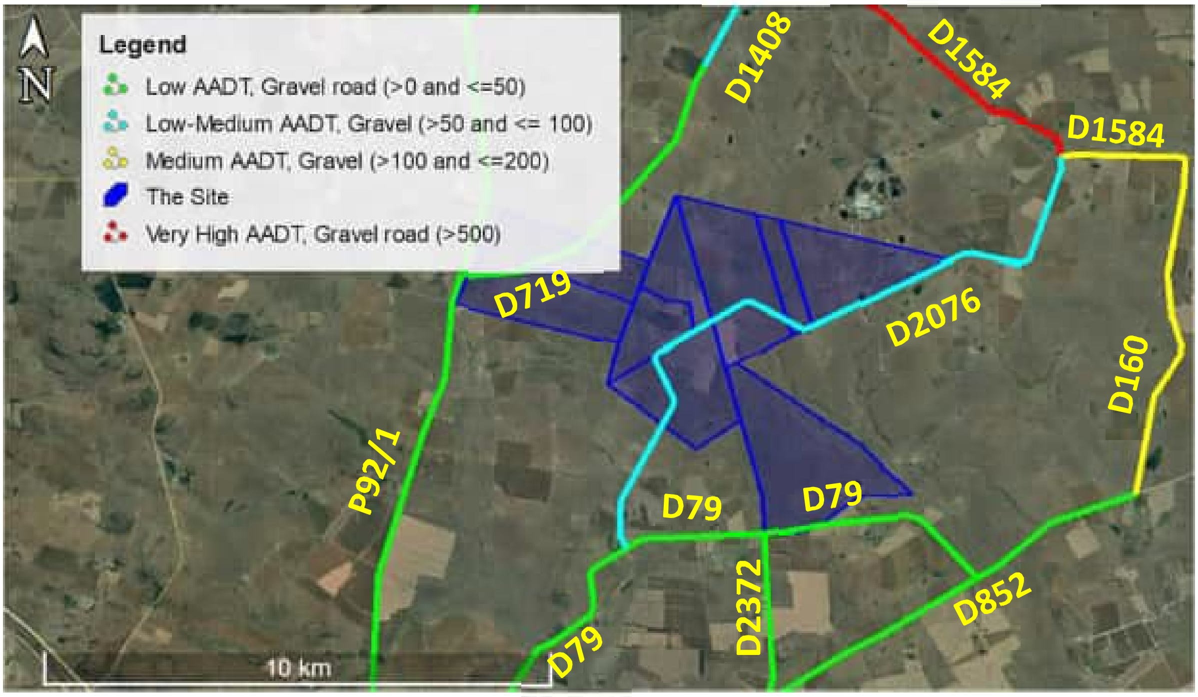

Figure 5-5: Link AADT (Mpumalanga Provincial Road Asset Management System (RAMS), n.d.)

5.4 Internal Roads

The geometric design and layout for the internal roads from the access points needs to be established at detailed design stage. Existing structures and services, such as drainage structures, signage, street lighting and pipelines will need to be evaluated if impacting on the roads. It needs to be ensured that gravel sections remain in good condition and will need to be maintained during the additional loading of the construction phase and then reinstated after construction is completed.

The geometric design constraints encountered due to the terrain should be taken into consideration by the geometric designer. Preferably, the internal roads need to be designed with smooth, relatively flat gradients (recommended to be no more than 8%) to allow a larger transport load vehicle to ascend to the respective laydown areas.

5.5 Transportation of Materials, Plant and People to the proposed site

It is assumed that the materials, plant, and workers will be sourced from the surrounding towns as far as possible. These town include but are not limited to Greylings, Balfour, Donelly, Crestlands, Secunda, Trichardt, Evander, Embalenhle, Kinross, and Bethal (see **Figure 5-6**).

Figure 5-6: Surrounding Towns

5.6 Public Transport and Non-Motorised Transport

In terms of the National Land Transport Act (NLTA) (Act No.5 of 2009), it is a requirement that an assessment of the available public transport services be included in Traffic Impact Assessment. The following comments are relevant in respect to the public transport availability for the proposed development.

5.6.1 Public Transport

Based on the latest Dipaleseng municipality spatial development framework (2010), non-motorised transportation (NMT) such as walking is the most prevalent form of transportation in the municipality.

Since 2001, the Department of Transport has developed a strategy called the Shova Kalula Bicycle Project (2007), which is aimed at addressing transport challenges in rural communities by distributing bicycles. It is anticipated that cycling has increased since the implementation of the project.

Private cars (as a driver or as a passenger) and minibus/taxis are the second-most used mode of transport (±4%) followed by buses ±3%.

The Dipaleseng Municipality IDP 2021-2022 show that there is no integrated transport plan in place thus there are currently no known future planned public transport facilities in the vicinity of the site.

The D1584 and the D160 have taxi and bus traffic however the routes are located beyond the 1.5km walking distance considered for good pedestrian accessibility.

It must however be noted that for large scale construction projects and remote construction projects, transport arrangements are typically made for workers during the construction stage.

5.6.2 Non-motorised Transport (NMT)

The site is a green fields project site with no NMT facilities. The surrounding road network connecting to the site comprises of gravel roads with no NMT facilities. It is recommended that the internal roads accommodate pedestrian facilities on at least one side of the road with a minim 1.5m width. Alternatively, a wide shoulder can be accommodated to allow pedestrians to travel safely outside of the vehicle travelled way.

6 ISSUES, RISKS AND IMPACTS

6.1 Identification of Potential Impacts/Risks

The potential impacts to the surrounding environment expected to be generated form the development traffic is traffic congestion and associated noise, dust, and exhaust pollution. This will be true for the construction, operation, and decommissioning phase. It must be noted that significance of the impact is expected to be higher during the construction and decommissioning phase because these phases generate the highest development traffic.

6.1.1 Construction phase

This phase includes the transportation of people, construction materials and equipment to the site. This phase also includes the construction of the WEF, including construction of footings, roads, excavations, trenching, and ancillary construction works. This phase will temporarily generate the most development traffic.

Nature of impact:

The nature of the impact expected to be generated at this stage would be traffic congestion and delays on the surrounding road network as well as the associated noise, dust, and exhaust pollution due to the increase in traffic.

Estimated peak hour traffic generated by the site:

1. **<u>Wind Energy Facility:</u>**

   i. **<u>Material delivery:</u>** This includes heavy vehicles for the transport of building materials such as reinforced concrete materials for foundations, gravel material for roadworks, brickwork material for buildings, fencing material, etc. The major trip generation activities are assumed to result from the construction of turbine foundations and road material delivery.

   - Heavy vehicles (turbine foundations): Based on similar studies, typically 87 trips per 500m^3 foundation is estimated for the turbine foundation.
     With a maximum estimated 650m^3 for each foundation, 18 daily trips are estimated for foundation material delivery.

   - Heavy vehicle (road layer works): Assuming a typical 0.2m gravel wearing course and a 10m road width, 2.04m^2 of gravel wearing course is assumed for the purpose of the trip estimate.

     Typically, 1 trip/6m^3 can be assumed for material delivery. With an estimated 60km road length,57 daily trips are estimated for road material delivery.

   - Heavy vehicles (laydown area material): 1 trip/6m^3 is assumed. With an envisaged 27000m^2 laydown area and an assumed 0.2m gravel wearing course is assumed, total 26 daily trips are estimated for laydown area material delivery.

   Assuming 235 annual working days, a 9-month site preparation and civil works construction period, 101 daily trips and 40% of daily traffic occurring during the peak period, 41 peak hour trips are assumed for material delivery.

It must also be noted that vehicle trips from material delivery vary depending on the construction task/program, fuel supply arrangements, as well as distance from the material source to the site. Project planning can be used to reduce material delivery during peak hours.

ii. **Construction machinery:** This includes cranes for turbine assembly, heavy vehicles required for earthworks and roadworks. 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.

iii. **Component delivery trips:**

The blades*:* For this project a maximum rotor diameter of 200m is assumed (i.e., 100 m blades). As a worst-case scenario, it is assumed that the blades will be transported separately (i.e., *three* (*3) trips per turbine or 84 trips for 28wind turbines*).

The nacelle: one (1) abnormal load trip per turbine *(i.e., 28 trips for 28 turbines)*

The turbine hub and rotor unit: one (1) abnormal load trip per turbine (i.e., 28 trips for 28 turbines)

Tower sections: For a maximum hub height of 200 metres, a maximum of 10 tower sections is required. Each tower section is transported separately on a low-bed trailer *(i.e., 10 abnormal load trips per turbine or 280 trips for 28 turbines)*

Total abnormal loads per turbine (turbine components): 15 trips per turbine (i.e., 420 trips for 28 turbines)

In addition to the turbine component delivery trips, one (1) abnormal load is estimated for the transformer.

The abnormal load trips are highly depended on project planning and abnormal load permitting. These trips are not necessarily concentrated to the peak hours. The number of peak hour vehicle trips generated by abnormal load vehicles is thus unknown at this stage.

iv. **Construction workers trips:**

The number of construction personnel is affected by project programming however the current estimate is at 200 to 250 workers.

It is further assumed that approximately 50% (max 125) will be low skilled workers (construction labourers, security staff etc.), ~30% (max 75) semi-skilled workers (drivers, equipment operators etc.) and approximately 20% (max 50) skilled personnel (engineers, land surveyors, project managers etc.).
Typically, contractors arrange transportation for site workers. Assuming the low skilled and semi-skilled labourers can commute by bus with a 60-passenger capacity, four (4) busses can be assumed for low skilled and semi-skilled labourers. The skilled labourers are conservatively assumed to travel by passenger car (50 trips).

For rural environments it is further estimated that the peak hour trips are around 20-40% of the average daily traffic (i.e., 22 peak hour trips).

2. Traffic during the Construction of Grids/Power lines:

The grid/ powerline expected for the site is a 132 kV overhead power line and a step-down Substation (SS) to feed the electricity generated by the project into the proposed Green Hydrogen Electrolyser facility located at Sasol Secunda which is between 5 and 10 km from the on-site SS.

The powerline components are expected to be transported by normal load vehicles.

Estimated peak hour traffic generated by the site:

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

The materials and most 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 proposed site can also reduce peak hour trips.

The transmission tower sections, and transformer are expected to be transported by abnormal load. The number of tower sections and transformer units is unknown thus the number of abnormal loads cannot be estimated.

ii. **Construction machinery:** 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.

iii. **Site personnel and workers:** Based on information obtained from similar projects it is assumed that 50 to 70 workers can be expected on site per workday for the powerline construction.

Busses have an average 60 passenger capacity and assuming approximately 20% 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 bus trip).

Assuming 40% of the trips will occur during the peak hour, a maximum of 6 peak hour site personnel trips is assumed for the purposes of this assessment.

3. **Total estimated construction trips:**

The summary of estimated total development trips is shown in **Table 6-1**.

Table 6-1: Summary of total estimated maximum peak hour trips (construction phase)

	Trip generator	Total	Daily	Peak
Wind energy component	**Material delivery**	-	101	41
	Construction machinery	Negligible		
	Component delivery	420	Unknown (depends on abnormal load permits)	
	Site personnel	54	-	22
Grid connection	**Construction vehicles**	Negligible		
	Component delivery	Negligible (short-term delivery trips expected)		
	Site personnel	15	-	6

The above trip estimates are dependent on the construction period, construction programming, material availability, component delivery, abnormal load permitting etc. It will be important to schedule the construction trips to spread the trips over the day, minimising congestion.

6.1.2 Operational Phase

This phase includes the operation and maintenance of the WEF throughout its life span.

Nature of impact:

The nature of the impact expected to be generated at this stage would be traffic congestion and delays on the surrounding road network, and the associated noise, dust, and exhaust pollution due to the operational traffic trips.

Estimated peak hour traffic generated by the site:

- **Trips generated by staff traveling to the site:**

The number of permanent staff expected for the operational phase is still unknown. Based on similar studies it can be estimated that approximately 30 full-time employees will be stationed on site. Assuming 40% of trips occur during the peak hour, approximately 12 peak hour trips are estimated for the operational phase.

It is thus not envisaged that the generated operation traffic will go beyond 50 peak hour trips. The operational peak hour trips generated by staff are expected to be low and will have a negligible impact on the external road network.

6.1.3 Decommissioning phase

This phase will have similar impacts and generated trips as the Construction Phase.

6.2 Cumulative Impacts

6.2.1 Construction phase

To assess the cumulative impact, it will be assumed that all authorised and proposed renewable energy projects within the vicinity of the site, would be constructed at the same time. It must be noted that this is a conservative approach.

Five renewable energy projects are located within a 55km radius of the site, namely:

- The authorised Tutuka 65.9 MW Solar Photovoltaic (PV) Energy Facility and its associated infrastructure (Ref: 14/12/16/3/3/2/754) located 46km south-east of the site;
- The proposed Mukondeleli WEF (300MW) to be located east of the site;
- The proposed Vhuvhili Solar Energy Facility (NEAS No. MPP/EIA/0001063/2022) located approximately 34km north-east of the site; and
- The authorised Grootvlei 75 MW Solar (PV) electricity installation (Ref: 12/12/20/2060) located 27km southwest of the site.

The total estimated construction peak hour trips are summarised in **Table 6-2** .It must however be noted that this is a conservative estimate, and the likelihood of occurrence is considered low due to the following:

- Renewable energy projects are affected by funding and economic viability.
- Projects targeted to supply energy to the national grid are subject to a highly competitive bidding process. Only a handful of projects would be selected to enter into a power purchase agreement with Eskom.
- Even if all renewable energy projects are constructed and decommissioned on the same time, the roads authority will consider all applications for abnormal loads and work with all project companies to ensure that loads on the public roads are staggered and staged to ensure that the impact will be acceptable.

Table 6-2:Estimated Cumulative construction trips

Developments	Megawatt	Estimated peak hour construction traffic (excluding abnormal loads)
Tutuka Solar Photovoltaic (PV)	65.9	21
Mukondeleli WEF	300	79
Grootvlei Solar Pv facility	75	24
Vhuvhili Solar Energy Facility	300	67
Total peak hour trips		**191**

6.2.2 Operational phase

The total estimated operational peak hour trips are summarised in **Table 6-3**.

Table 6-3:Estimated Cumulative operational trips

Developments	Megawatt	Estimated peak hour traffic
Tutuka Solar Photovoltaic (PV)	65.9	4
Mukondeleli WEF	300	12
Grootvlei Solar Pv facility	75	4
Vhuvhili Solar Energy Facility	300	12
Total peak hour trips		**32**

6.2.3 Decommissioning phase

This phase will have a similar impact as the Construction Phase (i.e., traffic congestion, air pollution and noise pollution) as similar trips/movements are expected.

7 IMPACT ASSESSMENT

7.1 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 due to the similarity in nature of the traffic demand expected for both phases.

Nature of the impact

- Noise and dust pollution associated potential traffic

Table 7-1: Noise impact (construction stage)

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating
Impact 1:	Noise emission	Increase in noise due to increase in traffic.	Construction	Negative	moderate	3	2	3	2	4	**40**	**Moderate**
				Significance		N/A						
						Post-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating
				Negative	moderate	2	1	3	2	3	**24**	**Low**
				Significance		N/A						

Table 7-2: Dust impact (construction stage)

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating
Impact 2:	Dust Emissions	Decrease in ambient air quality due to dust	Construction	Negative	moderate	3	2	3	2	4	**40**	**Moderate**
				Significance		N/A						
						Post-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating
				Negative	moderate	2	1	3	2	3	**24**	**Low**
				Significance		N/A						

Table 7-3: Noise cumulative impact (construction stage)

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating
Impact 1:	Noise emission	Increase in noise due to increase in traffic.	Construction	Negative	moderate	3	3	3	3	4	**48**	**Moderate**
				Significance		N/A						
						Post-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating
				Negative	moderate	2	2	3	3	3	**30**	**Low**
				Significance		N/A						

Table 7-4: Dust cumulative impact (construction stage)

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating
Impact 2:	Dust Emissions	Decrease in ambient air quality due to dust	Construction	Negative	moderate	3	3	3	3	4	**48**	**Moderate**
				Significance		N/A						
						Post-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating
				Negative	moderate	2	2	3	3	3	**30**	**Low**
				Significance		N/A						

7.2 Potential Impact (Operation Phase)

Nature of the impact

- Noise and dust pollution associated potential traffic

Table 7-5:Noise impact (operational stage):

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating
Impact 1:	Noise emission	Increase in noise due to increase in traffic.	Operation	Negative	moderate	2	1	3	4	3	**30**	**Low**
				Significance		N/A						
						Post-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating
				Negative	moderate	1	1	1	4	2	**14**	**Very low**
				Significance		N/A						

Table 7-6:Dust impact (Operational stage)

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating
Impact 2:	Dust Emissions	Decrease in ambient air quality due to dust	Operation	Negative	moderate	2	1	3	4	3	**30**	**Low**
				Significance		N/A						
						Post-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating
				Negative	moderate	1	1	1	4	2	**14**	**Very low**
				Significance		N/A						

Table 7-7:Noise cumulative impact (Operational stage):

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating
Impact 1:	Noise emission	Increase in noise due to increase in traffic.	Operation	Negative	moderate	3	2	3	4	3	**36**	**Moderate**
				Significance		N/A						
						Post-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating
				Negative	moderate	2	1	3	4	2	**20**	**low**
				Significance		N/A						

Table 7-8:Dust cumulative impact (Operational stage)

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating
Impact 2:	Dust Emissions	Decrease in ambient air quality due to dust	Operation	Negative	moderate	3	2	3	4	3	**36**	**Moderate**
				Significance		N/A						
						Post-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating
				Negative	moderate	2	1	3	4	2	**20**	**low**
				Significance		N/A						

7.3 Potential Impacts during the Decommissioning Phase

This phase will have a similar impact as the Construction Phase (i.e., traffic congestion, air pollution and noise pollution) as similar trips/movements are expected.

7.4 Mitigation measures

7.4.1 Construction and decommissioning phase

Noise, dust, and exhaust pollution during the construction and decommissioning phase cannot be completely mitigated but the following mitigation measures will significantly reduce the impact:

- The transport 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.
- The use of mobile batch plants and quarries near the site would decrease the traffic impact on the surrounding road networks.
- Staff and general trips should occur outside of peak traffic periods as far as possible. The use of busses and taxis to transport staff can also limit construction phase trips.
- The preferred abnormal load travel routes should be surveyed to identify problem areas (e.g., intersections with limited turning radii and sections of the road with sharp horizontal curves or steep gradients, which may require modification).
- Design and maintenance of internal roads. Any internal gravel roads will require grading with a grader to obtain a flat even surface and the geometric design of these gravel roads needs to be confirmed at detailed design stage. This process is to be undertaken by a civil engineering consultant or a geometric design professional.

7.4.2 Operational phase

Noise, dust, and exhaust pollution cannot be completely mitigated but the following mitigation measures will significantly reduce the impact:

- The delivery of water to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.
- The use of on-site water sources (e.g., bore hole water) would decrease the traffic impact on the surrounding road networks.
- Maintenance of internal roads to maintain good riding quality.
- Staff and general trips should occur outside of peak traffic periods as far as possible. The use of busses and taxis to transport staff can also limit construction phase trips.

7.5 NO-GO ALTERNATIVE

The no-go alternative implies that the proposed development does not proceed. This would mean that there will be no negative environmental impacts and no traffic impact on the surrounding network. However, this would also mean that there would be no socio-economic benefits to the surrounding communities, and it will not assist government in meeting energy demands. **Hence, the no-go alternative is not a preferred alternative.**

8 IMPACT ASSESSMENT SUMMARY

Table 8-1 shows a summary of the overall impact significance.

Table 8-1:Overall Impact Significance (Post Mitigation)

Phase	Overall Impact Significance
Construction	Low
Operational	Very low
Decommissioning	Low
Nature of Impact	**Overall Impact Significance**
Cumulative - Construction	Moderate
Cumulative - Operational	Low
Cumulative - Decommissioning	Moderate

9 FINAL SPECIALIST STATEMENT

Traffic impact assessments are generally assessed for the operation phase of a development. Based on similar studies, wind energy facilities have a low peak hour traffic impact with less than 50 peak hour trips expected to be generated.

The development is supported from a transport perspective provided that the recommendations and mitigations contained in this report are adhered to.

The impacts associated with the Impumelelo WEF are acceptable with the implementation of the recommended mitigation measures and can therefore be authorised.

10 REFERENCES

1. Mp-rams.co.za. n.d. *Mpumalanga Provincial Road Asset Management System (RAMS)*. [online] Available at: <http://mp-rams.co.za/rams/rams.html> [Accessed 22 November 2021].
2. Transnetportterminals.net. n.d. *Transnet Port Terminals*. [online] Available at: <https://www.transnetportterminals.net/Ports/Pages/default.aspx> [Accessed 23 November 2021].
3. Govan Mbeki Local Municipality, n.d. *Govan Mbeki Spatial Development Framework 2014-2034*. Republic of South Africa, Department: Rural Development & Land Reform, pp.Pg.228-235.

Annexure A: Impact Assessment Methodology

IMPACT ASSESSMENT METHODOLOGY

SCOPING PHASE

REPORTING REQUIREMENTS

- Project Description
- Legislative Context (as applicable)
- Assumptions and limitations
- Description of Baseline Environment – including sensitivity mapping
- Identification and high-level screening of impacts
- Plan of Study for EIA

HIGH-LEVEL SCREENING OF IMPACTS AND MITIGATION

Appendix 2 of GNR 982, as amended, requires the identification of the significance of potential impacts during scoping. To this end, an impact screening tool has been used in the scoping phase. The screening tool is based on two criteria, namely probability; and, consequence (**Table 0-3**), where the latter is based on general consideration to the intensity, extent, and duration.

The scales and descriptors used for scoring probability and consequence are detailed in **Table 0-3** and **Table 0-2** respectively.

Table 0-1: Probability Scores and Descriptors

SCORE	DESCRIPTOR
4	**Definite**: The impact will occur regardless of any prevention measures
3	**Highly Probable**: It is most likely that the impact will occur
2	**Probable**: There is a good possibility that the impact will occur
1	**Improbable:** The possibility of the impact occurring is very low

Table 0-2: Consequence Score Descriptions

SCORE	NEGATIVE	POSITIVE
4	Very severe: An irreversible and permanent change to the affected system(s) or party(ies) which cannot be mitigated.	Very beneficial: A permanent and very substantial benefit to the affected system(s) or party(ies), with no real alternative to achieving this benefit.

3	Severe: A long term impacts on the affected system(s) or party(ies) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming or some combination of these.	Beneficial: A long term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these.
2	Moderately severe: A medium to long term impacts on the affected system(s) or party (ies) that could be mitigated.	Moderately beneficial: A medium to long term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are equally difficult, expensive and time consuming (or some combination of these), as achieving them in this way.
1	Negligible: A short to medium term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary.	Negligible: A short to medium term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these.

Table 0-3: Significance Screening Tool

CONSEQUENCE SCALE

PROBABILITY SCALE		**1**	**2**	**3**	**4**
	1	**Very Low**	**Very Low**	**Low**	**Medium**
	2	**Very Low**	**Low**	**Medium**	**Medium**
	3	**Low**	**Medium**	**Medium**	**High**
	4	**Medium**	**Medium**	**High**	**High**

The nature of the impact must be characterised as to whether the impact is deemed to be positive (+ve) (i.e. beneficial) or negative (-ve) (i.e. harmful) to the receiving environment/receptor. For ease of reference, a colour reference system (**Table 0-4**) has been applied according to the nature and significance of the identified impacts.

Table 0-4: Impact Significance Colour Reference System to Indicate the Nature of the Impact

Negative Impacts (-ve)	**Positive Impacts (+ve)**
Negligible	**Negligible**
Very Low	**Very Low**
Low	**Low**
Medium	**Medium**
High	**High**

EIA PHASE

REPORTING REQUIREMENTS

- Project Description
- Legislative Context (as applicable)
- Assumptions and limitations
- Description of methodology (as required)
- Update and/or confirmation of Baseline Environment – including update and / or confirmation of sensitivity mapping
- Identification and description of Impacts
- Full impact assessment (including Cumulative)
- Mitigation measures
- Impact Statement

Ensure that all reports fulfil the requirements of the relevant Protocols.

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 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 0-5**.

Table 0-5: 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

[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.

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
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	**4 to 15**	**16 to 30**	**31 to 60**	**61 to 80**	**81 to 100**
Environmental Significance Rating (Negative (-))	**Very low**	**Low**	**Moderate**	**High**	**Very High**
Environmental Significance Rating (Positive (+))	**Very low**	**Low**	**Moderate**	**High**	**Very 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 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 1** below.

Avoidance / Prevention	Refers to considering options in project location, nature, scale, layout, technology and phasing to **avoid** environmental and social impacts. Although this is the best option, it will not always be feasible, and then the next steps become critical.
Mitigation / Reduction	Refers to considering alternatives in the project location, scale, layout, technology and phasing that would **minimise** environmental and social impacts. Every effort should be made to minimise impacts where there are environmental and social constraints.
Rehabilitation / Restoration	Refers to the **restoration or rehabilitation** of areas where impacts were unavoidable and measure are taken to return impacted areas to an agreed land use after the activity / project. Restoration, or even rehabilitation, might not be achievable, or the risk of achieving it might be very high. Additionally it might fall short of replicating the diversity and complexity of the natural system. Residual negative impacts will invariably still need to be compensated or offset.
Compensation / Offset	Refers to measures over and above restoration to remedy the residual (remaining and unavoidable) negative environmental and social impacts. When every effort has been made to avoid, minimise, and rehabilitate remaining impacts to a degree of no net loss, **compensation / offsets** provide a mechanism to remedy significant negative impacts.
No-Go	Refers to 'fatal flaw' in the proposed project, or specifically a proposed project in and area that cannot be offset, because the development will impact on strategically important ecosystem services, or jeopardise the ability to meet biodiversity targets. This is a **fatal flaw** and should result in the project being rejected.

Figure 1: Mitigation Sequence/Hierarchy

Annexure B: Specialist Statement of Independence

I, Adrian Johnson, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations, and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan, or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist: ____________________________

Name of Company: JG Afrika (Pty) Ltd

Date: 18-01-2023