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BRANDVALLEY WIND ENERGY FACILITY
TRANSPORT MANAGEMENT PLAN

November 2021
REVISION 1

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SYNOPSIS

Preparation of the Transport Management Plan for the proposed Brandvalley Wind Energy Facility, located on the border of the Western Cape and Northern Cape Provinces.

KEY WORDS:

Wind Energy Facility, Transport Management Plan

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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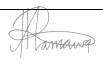
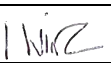
By Author	Engineer	A Ramawa		18-11-2021
Checked by:	Associate	I Wink		18-11-2021
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BRANDVALLEY WIND ENERGY FACILITY
TRANSPORT MANAGEMENT PLAN

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1 INTRODUCTION

WSP appointed JG Afrika PTY (Ltd) to provide a Transport Management Plan (TMP) for the Brandvalley Wind Energy Facility (WEF) as part of the amendment and update of the Environmental Management Process (EMPr).

It is proposed to establish a 140MW WEF to be located approximately 25km north of Matjiesfontein, on the border of the Western Cape and Northern Cape Provinces. The site shares some access roads as well as farm portions with the Rietkloof WEF site. The location of the proposed WEF is shown in **Figure 1.1** below.

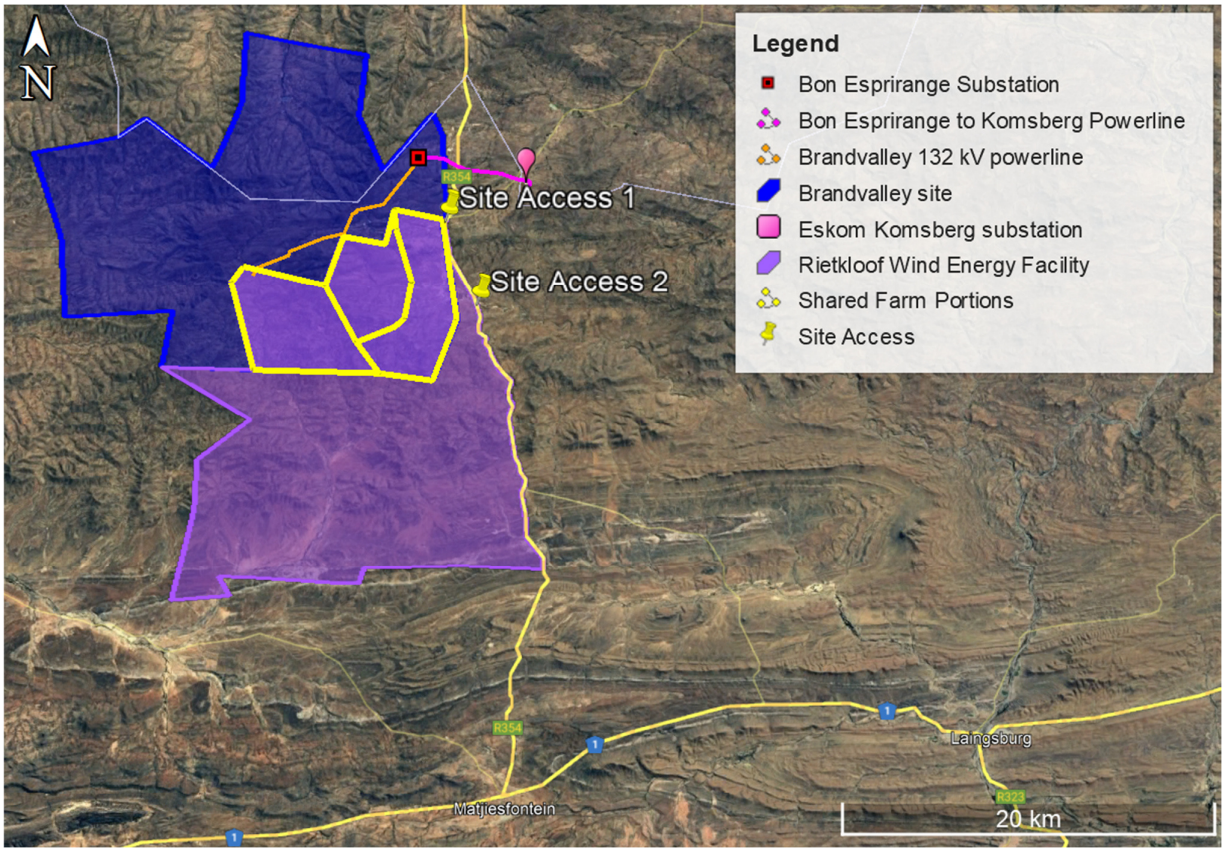

Figure 1-1: Locality Map

2 PURPOSE OF THE TRAFFIC MANAGEMENT PLAN

A Traffic Management Plan is required to ensure that the trips generated by the construction and operational activities associated with the proposed facility are mitigated as far as possible to:

- reduce the traffic impact on the surrounding road network,
- reduce potential conflicts that may results from the development traffic and the general traffic/public; and
- to identify potential routes for vehicles travelling to the site, particularly heavy and abnormal load vehicles.

This Traffic Management Plan has been prepared to enable the identification and implementation of all legal and best practice requirements in respect of the management of traffic associated with the construction and operation of the facility.

3 ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations apply:

- This TMP is based on the project information provided by the Client.
- Maximum vertical height clearances along the haulage route are at least 5.2m to be able to accommodate abnormal loads.
- The imported elements will be transported from the most feasible port of entry, which is deemed to be the Port of Saldanha.
- All haulage trips will occur on either surfaced national and provincial roads or existing gravel roads.
- Material for the construction will be sourced locally as far as possible.

4 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

5 SITE DESCRIPTION

5.1 General

It is proposed to develop the Brandvalley 140 MW WEF approximately 25km north of Matjiesfontein on the border of the Western Cape and Northern Cape Provinces. The proposed site will accommodate the following infrastructure:

- A maximum of 34 wind turbines with an individual energy generation capacity of up to 7 MW each. The wind turbine rotor diameter is proposed to be 180m with a hub height of 125m.
- Concrete foundations,
- transformers,
- Laydown areas,
- Construction camp and onsite batching plant of 1ha,
- Internal road network up to 9m in width,
- Buildings,
- Overhead powerlines and underground cabling,
- Low voltage yard onsite substation,
- Lighting system,
- Fencing of the site construction camp; and
- 4 x 125m tall wind measuring lattice masts strategically placed within the wind farm development footprint to collect data on wind conditions during the operational phase.

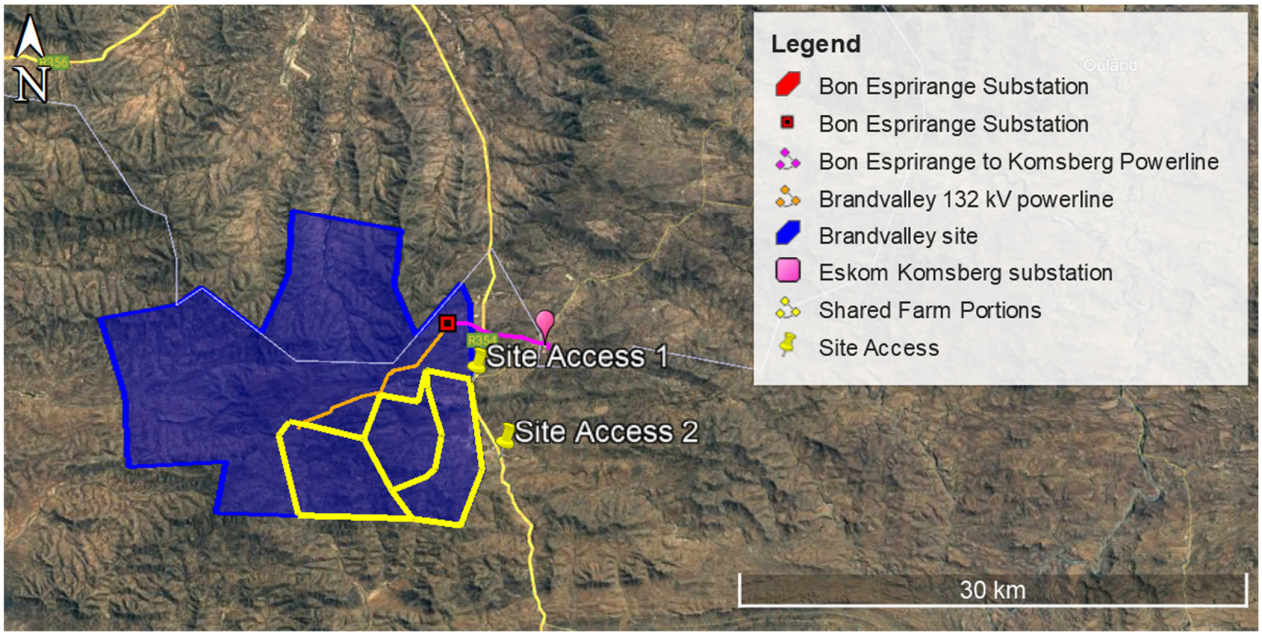

Figure 5-1:The Proposed Site

5.2 Powerline connection

A 132kV overhead powerline will be constructed to connect the Brandvalley WEF to the national grid via the existing Eskom Komsberg substation. The powerline will be an overhead powerline which will link to a proposed Bon Espirange substation (BE substation) on Remainder Bon Espirange 73. A Bon Espirange to Komsberg powerline route will be constructed to connect from the BE substation to the existing Eskom Komsberg substation.

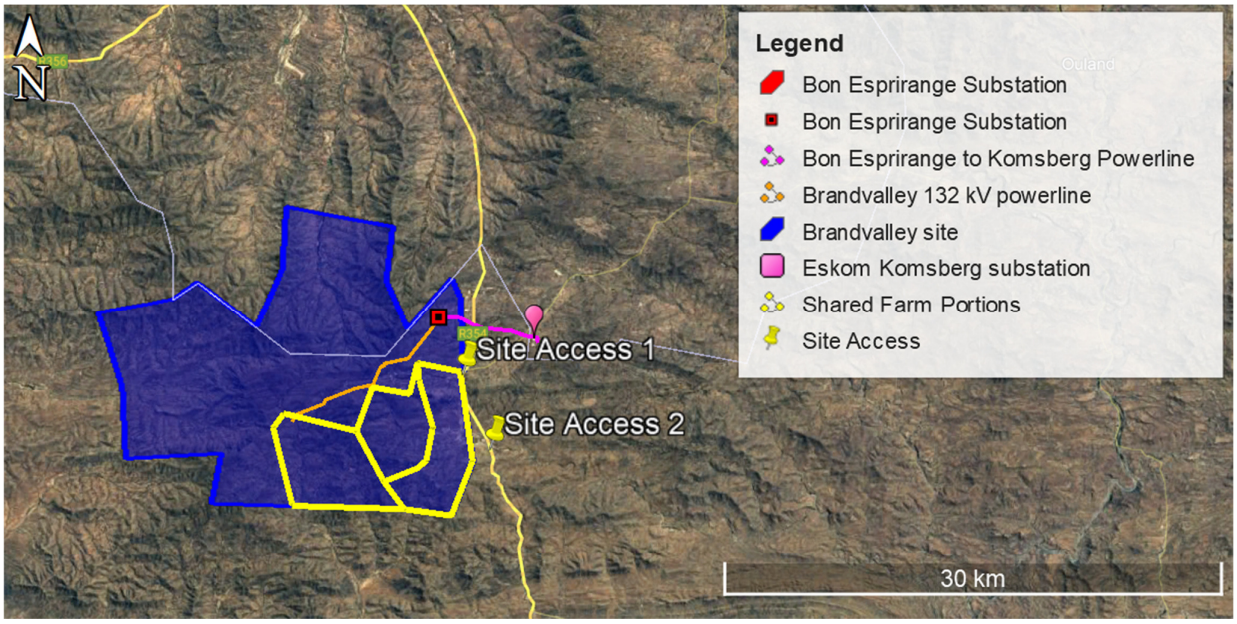

Figure 5-2: 132 KV Powerline

6 TRANSPORTATION ROUTES

Components will be transported to site using appropriate National and Provincial routes. It is expected that the turbine blades, nacelle and turbine hub will be transported by abnormal loads. Material delivery and site personnel travel will generally be conducted via normal load traffic.
Lifting equipment and counter weighs are required to off-load and assemble the components.

The transportation of abnormal load equipment and components require abnormal load permits as the dimension exceed the permissible maximum dimensions on road freight transport in terms of the Road Traffic Act (Act No. 93 of 1996).

6.1 Site access points

The proposed site layout considers two site access points connecting to the R354 located at the eastern end of the site. The site is accessed via existing minor provincial roads, namely OP08042 and OP08044. As the site is being accessed via existing access points, access spacing restrictions are not envisaged. It should, however, be noted that road upgrades may be required along the existing access roads to accommodate abnormal vehicles expected to deliver components to the site.

The R354 is a Class 2 Minor Arterial road running in a south-north direction from Matjiesfontein to the R356 in the Northern Cape. The road is a surfaced single carriageway with one lane per direction.

6.2 Port of entry

It is assumed that the blades and nacelle components will be imported to South Africa via the Port of Saldanha. The Port of Saldanha is South Africa's largest natural anchorage and port with the deepest water. It is located 60 nautical miles northwest of Cape Town (Longitude 170 58' E and Latitude 330 02' S) and is operated by Transnet National Ports Authority.

Depending on the type of turbine and tower, the tower sections can either be imported, or alternatively be manufactured locally. There are several types of towers available on the market, i.e., concrete, steel or hybrid concrete-steel towers. Within South Africa, steel towers can be sourced from Atlantis or Port Elizabeth, and concrete towers can be manufactured on site or sourced from the Cape Town area.

6.2.1 Main route for the transportation of the wind turbine components

Based on experience with similar projects as well as input from the previous transport investigation, the possible ports of entry include Port of Saldanha (approximately 364 km from the site), Port of Cape Town (approximately 267km from the site) or the Port of Ngqura (approximately 614km from the site).

The following aspects were considered about the above routes:

1. Port of Saldanha (approximately 364 km from the site):
   This is the second shortest route. The route comprises of high order routes surrounded by rural developments and farm properties and passes through Ceres and Moorreesburg. The density of these two towns is lower than the Cape Town area of route option 2.

2. Port of Cape Town (approximately 267km from the site):
   This route provides the shortest distance to the site and comprises entirely of high order routes from the port of entry to the site. However, sections of the route passes through highly developed areas (e.g., Cape Town, Paarl, Worcester etc). Due to this aspect, disruption of traffic due to the abnormal load traffic is expected along these built-up areas.

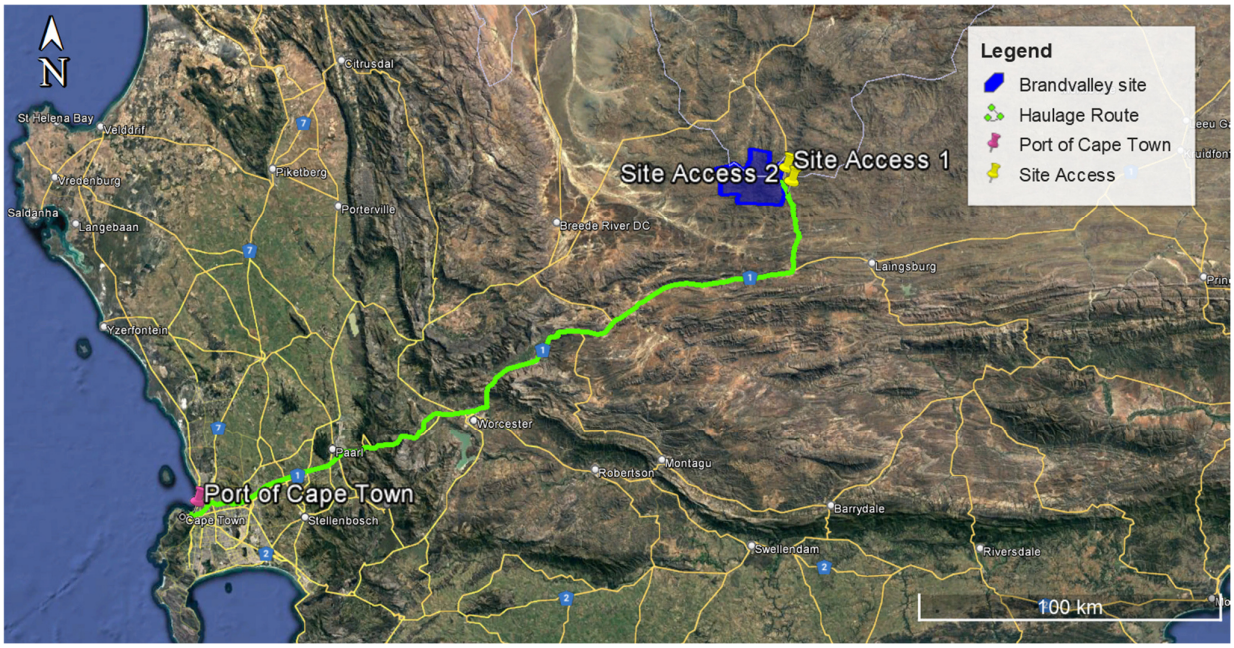

Figure 6-1: Route from the port of Cape Town to the Site

3. Port of Ngqura (approximately 614km from the site):
   This route has the longest distance to the site. It comprises of majority high order routes. It passes through some small towns with low densities. Not much congestion is expected.

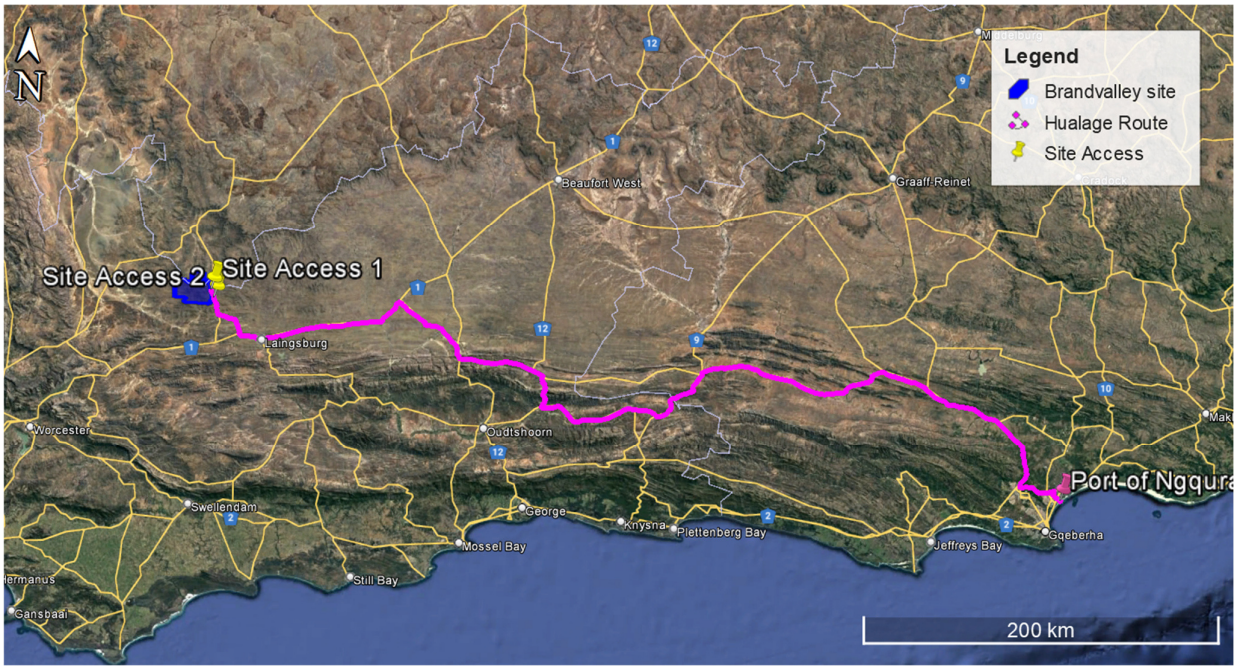

Figure 6-2:Route from the Port of Ngqura to the site

6.2.2 Preferred port of entry

The preferred port of entry to the site is the Port of Saldanha. This route maximises the use of higher order routes, which are designed to handle / accommodate larger vehicles and minimise travelling through towns as far as possible. This was deemed important to minimise congestion and avoid disruptions to communities in these towns.

The delivery company is advised to conduct a dry-run of the route to determine the practical suitability of the route for abnormal load travel.

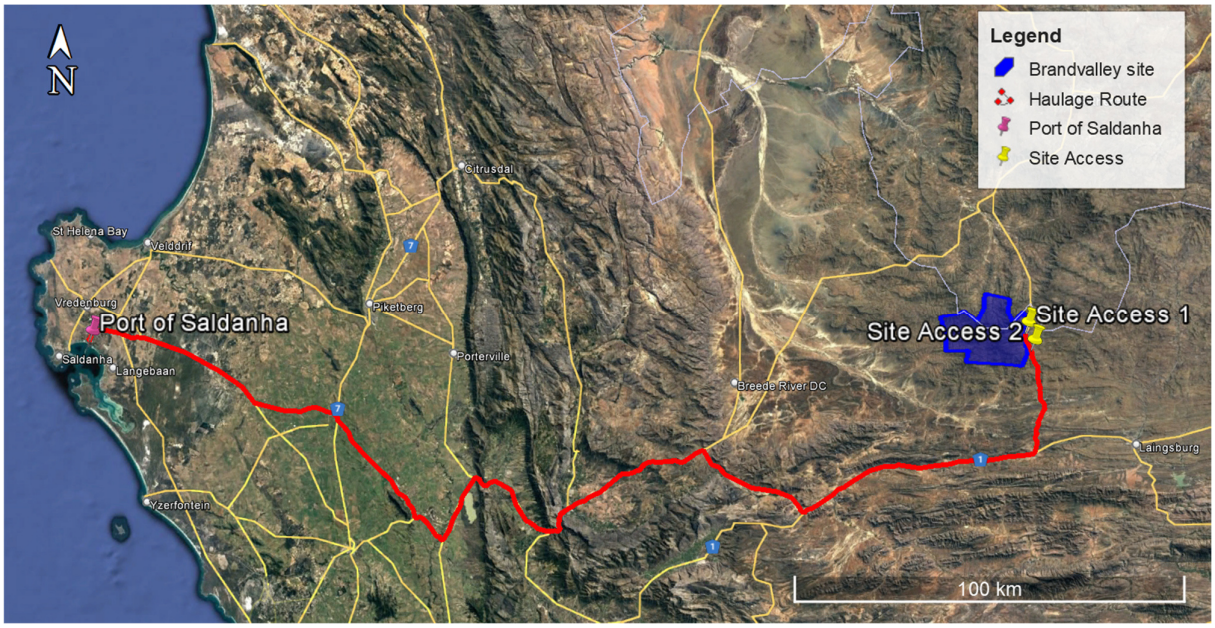

Figure 6-3:Preferred Route from the Port of Saldanha to the site

6.3 Main Route for the Transportation of Materials, Plant and People to the proposed site

It is envisaged that the workforce will most likely reside in Sutherland, Matjiesfontein, Touws River or Laingsburg as the closest communities. 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 the majority of construction personnel be transported to and from the site by means of busses or minibus taxis. This will reduce the number of trips bound for the site.

Building materials will most likely be sourced from Worcester approximately 160km form the site or alternatively from Cape Town approximately 260 km from the site. A significant reduction in heavy vehicle trips can be achieved by using mobile batch plants. In addition to this, temporary construction material stockpile yards could be commissioned on vacant land near the proposed site. Delivery of materials to the mobile batch plant and the stockpile yard could be staggered to minimise traffic disruptions.

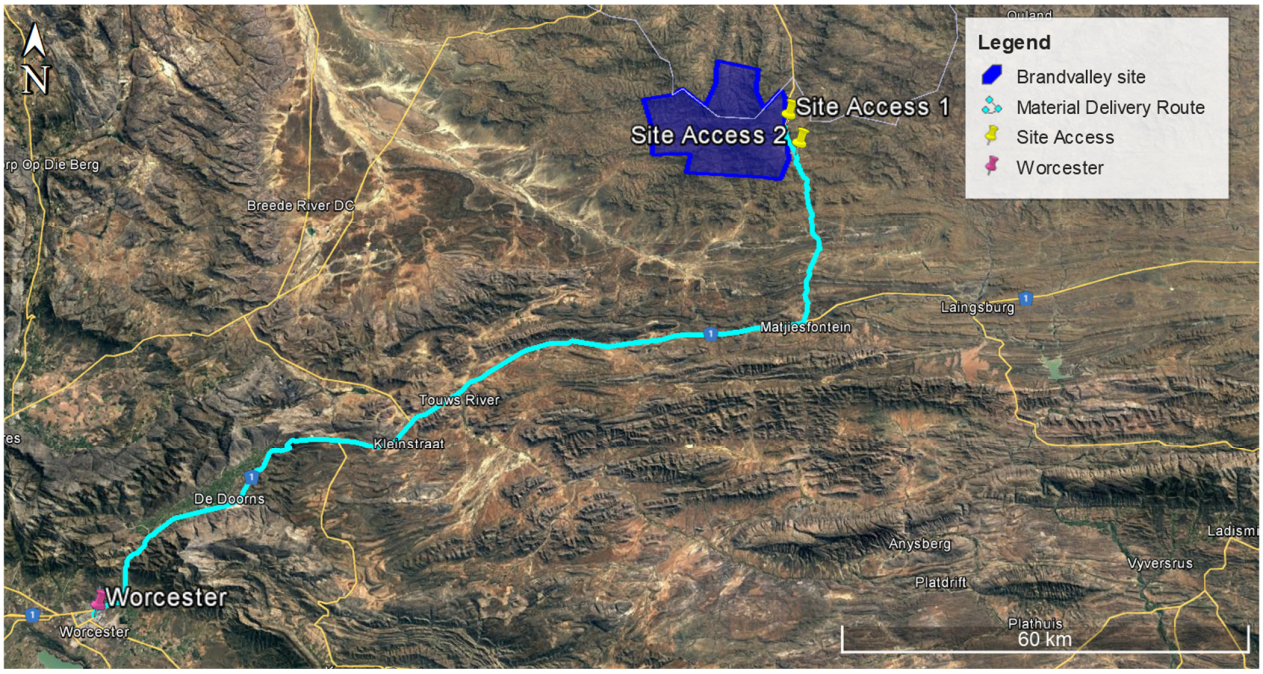

Figure 6-4: Envisaged Material delivery route

7 TRAFFIC MANAGEMENT PLAN

This Traffic Management Plan has been prepared in respect of the planning phase of the proposed facility. The Traffic Management Plan should be updated prior to the commencement of the construction phase, when detailed information regarding the delivery of components, traffic data and construction activities are available. A designated personnel member of the Contractor's team will be the custodian of the plan and the custodian will ensure that all personnel and subcontractors are trained to ensure compliance. The requirements of the Traffic Management Plan shall apply to all construction personnel and subcontractors appointed to provide vehicles, machinery or drivers. The Plan needs to be reviewed every four months or immediately after an incident, when corrective measures will be incorporated into the Plan.

Prior to the commencement of the operational phase, the plan should be updated to include the operational traffic requirements. A copy should be kept at the facility. A designated employee will ensure that the plan is enforced and will make sure that the Plan is available to all relevant personnel and external maintenance/repair teams. The Plan will be reviewed every annually or immediately after an incident, when corrective measures will be incorporated into the Plan.

7.1 Preliminary Transport Requirements

It is expected that the highest trip generator will be the construction and decommissioning phase. Abnormal load trips are limited to turbine blades, nacelle, turbine hub and lifting equipment. Staggered delivery and transporting components outside of the peak traffic periods (peak traffic periods for rural areas are assumed to be 6:30am – 8am and 4pm-6pm) will assist in mitigating the impact on the surrounding road network.

Construction traffic will include vehicles for deliveries, removal of materials and construction staff. Construction activities such as delivery of material or removal of soil can also be staggered or transported in off-peak hours. Based on a 18-24 month estimated construction period, an estimated 4 peak hour material delivery trips, 18 peak hour site personnel trips, and 12 abnormal load trips per turbine are expected to be generated by the site.

Traffic during the operational phase will be low as trips will only be for occasional maintenance requirements and staff trips (i.e., 20 employees per day).

The construction phase and decommissioning phase are expected to generate similar trips.

Proposed mitigation measures

- The delivery of components and construction materials to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.
- The use of batch plants (if required) and quarries near the site would decrease the impact on the surrounding road network.
- Staff and general trips should occur outside of peak traffic periods as far as possible.

- During construction Staff shuttle transport can be made available.

7.2 Transport Coordinator

It is recommended that a transport coordinator (or similar designation) be appointed to ensure compliance of the TMP. The coordinator shall make all the necessary arrangements to maintain the required traffic measures for the duration of the construction period.

7.3 Stakeholder Engagement

Interested and affected parties informed of all transport activities taking place that may affect them or require approval e.g., local community, the local authorities, law enforcement and affected landowners.

Stakeholder engagement should address and provide information to stakeholders regarding general construction activities, construction vehicles routes, projected timelines, procedures for complaints and emergency procedures.

7.4 Licensing

All construction vehicles shall have the necessary licences, a valid roadworthy certificate and shall comply with the relevant traffic and transport licencing requirements (such as abnormal loads or hazardous materials).

All drivers of vehicles shall have the requisite licences to operate any vehicle (or machinery) operated by them on site or on any public roads. A professional driving permit (PrDP) is required if any of the following vehicles are operated:

- Goods vehicles, (more than 3 500 kg).
- Breakdown vehicles.
- Buses (any bus).
- Minibus taxis (more than 3 500 kg), transporting 12 or more people, including the driver.
- Vehicles used to transport people for payment.
- Goods vehicle carrying dangerous goods (more than 3 500 kg).
- Road tank vehicles for petroleum-based flammable liquids.
- Motor vehicles transporting 12 or more people, including the driver.

7.5 Construction Staff

All staff shall be transported safely to site in appropriate vehicles. Staff shall not be allowed to be transported to site on the back of open trucks. Passenger vehicles shall not exceed the carrying capacity of the vehicle.
Collections/Drop-off points for staff shall be located at a safe distance from traffic and construction activities. Roads and areas used by construction vehicles shall, as far as possible be avoided by all personnel. Designated pedestrian pathways shall be demarcated where appropriate.

All staff shall receive the appropriate site safety induction training. Drivers shall be adequately trained in the identification and avoidance of road hazards, vehicle maintenance and care and safety requirements. All staff shall be informed of the construction site risks and training shall include appropriate precautionary measures required to be undertaken to facilitate safe and efficient traffic management (e.g., understanding signage, crossing roadways and utilising designated pedestrian pathways, reporting incidents).

7.6 Inspection of all Routes

A dry run of all routes is to be undertaken to identify any areas to avoid or obstacles that might disrupt the movement of the construction vehicles. All issues affecting the movement of construction vehicles are to be addressed immediately by the Contractor and relevant stakeholders e.g., law enforcement, relevant roads department and authorities.

7.7 Maintenance of vehicles

All vehicles and construction plant shall be regularly maintained, repaired when necessary and inspected on a regular basis to ensure that the vehicles are in good working order. Construction and passenger vehicles shall be monitored to ensure that vehicles are not overloaded.

7.8 Maintenance of roads

The Contractor shall maintain the road used by construction vehicles, repairing any damage caused by construction traffic to the surrounding road network. Where gravel roads are used, the roads shall be maintained, and dust control measures shall be implemented to avoid dust pollution.

Road verges at the site shall be regularly maintained to ensure that vegetation remains short and that the roads serve as an effective firebreak.

7.9 Signage

Signage, in accordance with the South African Road Traffic Signs Manual, will be required to be conspicuously placed at appropriate locations along all access roads, the internal roads to the site and public roads used by construction vehicles (in consultation with the relevant traffic authorities) to indicate the following:

- all road and pedestrian hazards;
- site access
- site offices
- wayfinding signs on internal roads e.g. parking, toilets, emergency assembly point
- crossing points;
- speed limits;
- turning traffic;
- dedicated routes for construction vehicles and staff
- no-go areas
- any traffic control information which may be relevant to the construction activity at the time.

It is recommended that flagmen be implement when high volumes of construction traffic are expected to help direct the traffic, thus ensuring the safe movement of the vehicles and reducing the potential conflicts.

7.10 Speed limit

All drivers operating vehicles shall comply with the posted speed limits (or the maximum allowable speed as per the permit for abnormal load vehicles) on public roads as well as a proposed 30km/h speed limit within the construction site and access roads.

The failure to adhere to the prescribed speed limits is an offence and disciplinary action may be taken by the Contractor.

7.11 Abnormal Loads

Abnormal loads will be transported to site as per the following:

7.11.1 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):

- 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
- Axle load limitation: 7.7t on front axle and 9t on 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.

7.11.2 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.

7.11.3 Permitting – General Rules

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.

7.11.4 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.

7.11.5 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
- Stability of Loaded Vehicles

7.11.6 Preferred Abnormal load route

The preferred route 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, 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, prior to the transportation of any components, to ensure that the delivery will occur without disruptions. This process is to be undertaken by the haulage company transporting the components and the Contractor, who will modify the road and intersections to accommodate abnormal vehicles. 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.

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.

8 CONCLUSIONS AND RECOMMENDATIONS

8.1 General

It is proposed to establish a 140MW WEF to be located approximately 25km north of Matjiesfontein, on the border of the Western Cape and Northern Cape Provinces.

8.2 Components

In general, each turbine unit consists of a tower, a nacelle (final weight dependent on the supplier and whether the nacelle has gears or not), and rotor blades. It is assumed that all turbine parts will be imported and shipped via the Port of Sadhana.

8.3 Traffic Management Plan

- This TMP has been prepared to enable the identification and implementation of all legal and best practice requirements in respect of the management of traffic associated with the construction and operation of the facility

- The Traffic Management Plan has been prepared in respect of the planning phase of the proposed facility. The Traffic Management Plan should be updated prior to the commencement of the construction phase and the operational phase.

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

  Mitigation measures include:

  - ✓ The delivery of components and construction materials to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.

  - ✓ using a mobile batch plant as well as temporary construction material stockpile yards near the proposed site.

  - ✓ Transporting site personnel to and from the site by means of busses or minibus taxis. This will reduce the number of trips bound for the site.

- The operation and maintenance phase include the operation and maintenance of the WEF. The envisaged site traffic would be limited to a few light vehicles, transporting approximately 20 employees per day.

  The maintenance or replacement of wind turbine components would require a crane and abnormal vehicles. Although abnormal load vehicles would be required, the maintenance or replacement of components can be staggered, and the transportation of the components would therefore take place over a short period of time, presumably delivered in one day.

Furthermore, traffic disruptions can be minimised by transporting the components during off-peak hours. This phase is therefore expected to generate minimal traffic.

- For abnormal load vehicles, it is recommended to undertake a “dry-run” with the largest abnormal load vehicle, to ensure that the vehicle can access the site.

8.4 Access Road

- The proposed access roads to the site are located off the R354.located to the east of the site.

- The typical traffic conditions in the area are that of light traffic volumes. It is however still recommended to mitigate any potential traffic impacts as much as possible.

- it is recommended that new access points be located at a minimum of 5 km from access points along the R354.This distance is measured between the centre lines of the access points.

8.5 Haulage routes for wind turbine components

- The proposed haulage route is outlined in Section 6. The route was chosen as the preferred route because it provides the shortest route to the wind farm site, utilises higher order routes as far as possible and minimises travelling through towns.

- It is recommended that the respective haulage company conducts a dry-run to determine the restrictions relevant to the haulage vehicle to be utilised. With some route’s road signs may need to be moved, overhead cables may need to be raised and bellmouths may need temporary widening to accommodate abnormal loads. A dry-run will help establish relevant changes specific to the abnormal load truck used to deliver the components and materials.

8.6 Preferred Route for Materials, Plant and Labour

- It is envisaged that the majority of materials, will be sourced from Worcester approximately 160km form the site or alternatively from Cape Town approximately 260 km from the site. The route utilises the N1 and R354 to access the site.

- It is envisaged that 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.