SOUTH AFRICA MAINSTREAM RENEWABLE POWER DEVELOPMENTS (PTY) LTD

KRAALTJIES WIND ENERGY FACILITY AND ASSOCIATED INFRASTRUCTURE

Transportation Study

Issue Date: 25 August 2023
Revision No: 3
Project No: 16170

Date:	25 August 2023	
Document Title:	**Kraaltjies Wind Energy Facility and Associated Infrastructure** Transportation Study	
Revision Number:	3	
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Signature:	 Pr. N°: 202202263	Date: 25 August 2023
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For:	SOUTH AFRICA MAINSTREAM RENEWABLE POWER (PTY) LTD	

Confidentiality Statement

EXECUTIVE SUMMARY

Objective

South African Mainstream Renewable Power Development (Pty) Ltd (Mainstream) proposes to construct and operate the Kraaltjies Wind Energy Facility (WEF) and associated infrastructure approximately 52 km south of the town of Beaufort West, Western Cape. The proposed facility will have a generating capacity of 240 MW. The overall objective is to generate electricity by means of renewable energy technology capturing wind energy to feed into the national grid.

The main objective of the 'Transportation Study' is to determine the impact/s of the proposed development on the area with respect to transportation and included these findings in the Environmental Impact Assessment (EIA). The assessment will comprise of a desktop assessment and will include preliminary transportation related matters arising during the construction phase, through the operation & maintenance phase, up to and including the decommissioning phase of the development. The assessment of these phases, will take into account the transportation of normal and abnormal vehicles, which are made up of *inter alia*; - WEF components, construction materials, equipment, construction workers and employees.

Key Findings

We don't foresee any major risks with respect the proposed development and therefore include our recommendations below, to take note of prior to and during the detailed design and construction stages. It should however be noted that a number of recommendations were highlighted from previous projects and are therefore noted as important.

The development is located in close proximity to provincial roads. An existing access onto the facility already exists in the form of a farm access point, however, the access for the future facility expansions, could be upgraded or moved to a new position in order to accommodate the proposed adjusted land use.

The construction / balance of plant phase of this development will typically generate the highest number of additional vehicles. It will however be temporary and impacts are considered to be nominal.

The existing access onto PTN 25 from the N12 freeway (Road TR03305) @ Km 51.80 has sufficient sight distance in both directions and hence an upgrade of the existing access will be required and a wayleave application to the Western Cape Department of Transport & Public Works (WCDTPW).

The existing access onto PTN 10 from the N12 freeway (Road TR03305) @ Km 55.46 does not have sufficient sight distance to the south and hence will require relocation. A new access position @ Km 54.68 is proposed and hence approval and a wayleave application will be required from the Western Cape Department of Transport & Public Works (WCDTPW) prior to work commencing.

A number of mitigation measures are proposed to accommodate the development and to reduce the impact to the surrounding road network.

Recommendation

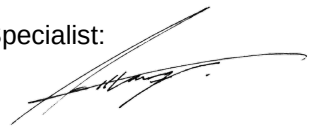
With reference to this report, associated assessment and the findings made within, it is SiVEST's opinion that the Kraaltjies WEF and associated infrastructure will have a nominal impact on the existing traffic network. The project is therefore deemed acceptable from a transport perspective, provided the recommendations and mitigations measures in this report are implemented, and hence the Environmental Authorisation (EA) should be granted for the EIA application.

DECLARATION BY SPECIALIST

I, NTUTHUKO HLANGUZA, 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 Specialist:



Name of Company: SiVEST SA (PTY) Ltd

Date: 25 August 2023

NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) AND ENVIRONMENTAL IMPACT REGULATIONS, 2014 (AS AMENDED) - REQUIREMENTS FOR SPECIALIST REPORTS (APPENDIX 6)

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	Section of Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Refer Section 4 and Appendix A
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Refer above
c) an indication of the scope of, and the purpose for which, the report was prepared;	Refer Section 3
(cA) an indication of the quality and age of base data used for the specialist report;	Refer Section 5
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Refer Section 10 Refer Section 11
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Refer Section 3
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Refer Section 3
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Refer Section 7
g) an identification of any areas to be avoided, including buffers;	N/A
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Refer Figure 8.1
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Refer Section 5
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, (including identified alternatives on the environment) or activities;	Refer Section 7 Refer Section 12
k) any mitigation measures for inclusion in the EMPr;	Refer Section 9
l) any conditions for inclusion in the environmental authorisation;	Refer Section 9
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Refer Section 9
n) a reasoned opinion- i. (as to) whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance,	Refer Section 12

management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
q) any other information requested by the competent authority.	N/A
2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A

SOUTH AFRICA MAINSTREAM RENEWABLE POWER (PTY) LTD
KRAALTJIES WIND ENERGY FACILITY
TRANSPORTATION STUDY

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1. INTRODUCTION

SiVEST Civil Engineering Division was appointed by South Africa Mainstream Renewable Power Developments (Pty) Ltd (hereafter referred to as “Mainstream") to complete a Transportation Study for the proposed 240 MW Kraaltjies Wind Energy Facility (WEF) and associated infrastructure (hereafter the “proposed facility / facilities”) situated approximately 52km south of the town of Beaufort West in the Western Cape Province.

The proposed facility, situated between Beaufort West and De Rust will be located within the Renewable Energy Development Zones (REDZs), namely the ‘Beaufort West REDZ’.

The proposed WEF is subject to a full Environmental Impact Assessment (EIA) process in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) as amended and EIA Regulations, 2014 (as amended). Accordingly, an EIA process as contemplated in terms of the EIA Regulations (2014, as amended) is being undertaken in respect of the proposed WEF project. The competent authority for this EIA is the national Department of Forestry, Fisheries and the Environment, (DFFE).

2. WIND ENERGY FACILITY COMPONENTS

The WEF will consist of the following:

2.1 Wind Farm Components

At this stage it is anticipated that the proposed Kraaltjies WEF will comprise of maximum twenty (20) wind turbines with a maximum total energy generation capacity of up to 240 MW. The electricity generated by the proposed WEF development will be fed into the national grid via a 132kV overhead power line. In summary, the proposed Kraaltjies WEF will include the following components:

- Up to twenty (20) wind turbines with a combined maximum export capacity of up to 240 MW. This will be subject to allowable limits in terms of the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). The final number of turbines and layout of the WEF will, however, be dependent on the outcome of the Specialist Studies conducted during the EIA process;
- Each wind turbine will have a hub height of up to 200m and rotor diameter of up to 200m;
- Permanent compacted hardstanding areas / platforms (also known as crane pads) of approximately 90m x 50m (total footprint of approx. 4 500m²) per turbine during construction and for on-going maintenance purposes for the lifetime of the proposed development;
- Each wind turbine will consist of a foundation of up to approximately 15m x 15m in diameter. In addition, the foundations will be up to approximately 3m in depth;
- Electrical transformers (690V/33kV) adjacent to each wind turbine (typical footprint of up to approximately 2m x 2m) to step up the voltage to 11-33kV;
- Associated infrastructure of approximately 25ha which includes;
    - One (1) new 11kV - 33/132kV on-site substation consisting of two (2) portions: IPP portion / yard (33kv portion of the shared 33kv/132kv portion) and an Eskom portion (132kv portion of the shared 33kv/132kv portion) including associated equipment and infrastructure, occupying a total area of approximately 25ha (i.e. 250 000m²). The Eskom portion will be ceded over to Eskom once the IPP has constructed the onsite substation. The necessary Transfer of Rights will be lodged with DFFE when required.

- A Battery Energy Storage System (BESS) will be located next to the onsite 11-33kV substation. The storage capacity and type of technology would be determined at a later stage during the development phase, but most likely comprise an array of containers, outdoor cabinets and/or storage tanks;
- One (1) construction laydown / staging area of up to approximately 3ha. It should be noted that no construction camps will be required in order to house workers overnight as all workers will be accommodated in the nearby town;
- Operation and Maintenance (O&M) buildings, including offices, a guard house, operational control centre, O&M area / warehouse / workshop and ablution facilities to be located on the site identified for the substation. This will be included in the 11-33kv portion/yard of the substation area. The wind turbines will be connected to the proposed substation via medium voltage (11-33kV) underground cabling and overhead power lines;

- Road servitude of 8m and a 20m underground cable or overhead line servitude.
- The wind turbines will be connected to the proposed substation via medium voltage (11-33kV) underground cabling and/or overhead power lines;
- The main access road will be approximately 8 - 12 m wide. During construction the internal and access roads will be up to 13.5m in some parts (i.e. for bringing in transformers etc), after construction they will be rehabilitated back down to 8m or less. Turns will have a radius of up to 50m for abnormal loads (especially turbine blades) to access the various wind turbine positions. It should be noted that the proposed application site will be accessed via the N12 National Route; During operation, internal roads with a width of up to approximately 5m (excluding reserves) wide will provide access to each wind turbine. Existing site roads will be used wherever possible, although new site roads will be constructed where necessary.
- A wind measuring lattice (approximately 140m in height) mast has already been strategically placed within the wind farm application site in order to collect data on wind conditions;
- No new fencing is envisaged at this stage. Current fencing is standard farm fence approximately 1-1.5m in height. Fencing might be upgraded (if required) to be up to approximately 2m in height; and
- Water will either be sourced from existing boreholes located within the application site or will be trucked in, should the boreholes located within the application site be limited.

3. OBJECTIVES AND SCOPE OF WORK

The main objective of the 'Transportation Study' is to determine the impact/s of the proposed development on the area with respect to transportation. The assessment will include a site investigation and will encompass preliminary transportation related matters arising during the construction phase, through the operation & maintenance phase, up to and including the decommissioning phase of the development. The assessment of these phases, will take into account the transportation of normal and abnormal vehicles, which are made up of *inter alia*; - WEF components, construction materials, equipment, construction workers and employees.

The scope of works consists of the following:

a) A site investigation which was completed between the 24 – 27th November 2021
b) Consultations with the relevant authorities and / or stakeholders which includes the collection of traffic data and information.
c) Desktop analysis of traffic data and information from the various authorities and / or stakeholders. Analysis to include the evaluation of the capacity of the road network (if required)
d) Evaluate the impact of the proposed development on the existing road network / traffic volumes and populating of a suitable 'Impact Rating System'

e) Determine specific traffic needs during the different phases of implementation.
f) Conclude & propose possible mitigation measures
g) Identify the position and suitability of the preferred access road alternatives.
h) Confirm the associated clearances required for the necessary equipment to be transported from the point of delivery to the various sites.
i) Confirm freight and transport requirements during construction, operation and maintenance period.
j) Propose origins and destinations of equipment
k) Determine Abnormal load requirements (if any)

3.1 Legal Requirement & Guidelines

Key legal requirements and guidelines to the proposed facilities are as follows:

- Government Notice 509 (GN509) as published in Government Gazette 40229 of 2016 and refers to the National Water Act, 1998 (Act No. 36 of 1998)
- National Environmental Management Act, 1998 (Act No 107 of 1998) (NEMA)
- National Water Act, 1998 (Act No 36 of 1998) (NWA)
- Road Safety Act (Act No 93 of 1996)
- National Road Traffic Regulations, 2000

4. SPECIALIST CREDENTIALS

This Transportation Study has been compiled by Merchandt Le Maitre and Ntuthuko Hlanguza from SiVEST Consulting Engineers. Ntuthuko is a professionally registered civil engineer with a BSc.Eng (Civil) qualification and post-graduate certificate in Energy Efficiency and Sustainability. He has over 7 years of experience in a wide range of civil engineering applications including specialist studies in the renewable energy sector. His experience in the different facets of Civil Engineering means he can advise clients in the renewable energy sector on transportation studies, access and internal road layouts and designs, glint and glare assessments, water demand and stormwater management. A full Curriculum Vitae is included in 'Appendix A.'

Table 4.1 Specialist Credentials & Experience

Company	SiVEST (Pty) Ltd
Contact Details	ntuthukoh@sivest.co.za
Qualifications	BSc.Eng (Civil) (UKZN) Cert. Energy Efficiency & Sustainability (UCT)
Professional Registrations & Memberships	• Pr. Eng – Engineering Council of South Africa • MSAICE – Member of South African Institute of Civil Engineers
Expertise to carry out the Transportation Study	• Karee WEF • Droogfontein 3 PV • Mierdam PV • Patatskloof WEF • Platsjambok West PV • Platsjambok East PV • Lesaka PV Cluster

5. ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations are to be noted:

- The analysis is based on the information provided at the time by Mainstream and their representatives.
- The design horizon for the WEF is assumed to be 20 years.
- Digital Terrain Model: 25m DEM from NGI (2014) & 2m DEM from GeoSmart (2016)
- Technical Specifications for the facility:

Technical Component	Dimensions
Number of Turbines	Maximum of 20
Height of Tower Sections	Approximately 29m
Capacity	240 MW Max
Hub Height	Up to 200m
Rotor Diameter	Up to ±200m
Construction Period (assumed)	±24 months / 2 years (TBC)
Expected Lifespan	20 to 25 years (TBC)
Road Width	Up to 5m (servitude of 8 m)

- Traffic Station Data / Counts and trip generation calculations are for one direction only and do not include return trips, unless indicated.
- This assessment is limited to the impact the development traffic will have on the network and not on the wider impacts known as background traffic. Such impacts can only be addressed in a detailed Traffic Impact Study which takes into account actual traffic counts undertaken during the peak periods.
- The information provided in this report is an informed estimate. Construction related traffic may however vary and be different to the information provided during construction phases as a result of supplier delivery schedule changes.
- Some of the figures provided are indicative figures as many of the components are still at design stage and will only be confirmed closer to time of construction.
- Seasonal impacts do not affect the assessment.

6. PROJECT DESCRIPTION

6.1 Locality

Mainstream proposes to construct and operate the Kraaltjies WEF approximately 52 km south of the town of Beaufort West, Western Cape. The proposed facility will have a maximum generating capacity of 240 MW. The overall objective is to generate electricity by means of renewable energy technology capturing wind energy to feed into the national grid.

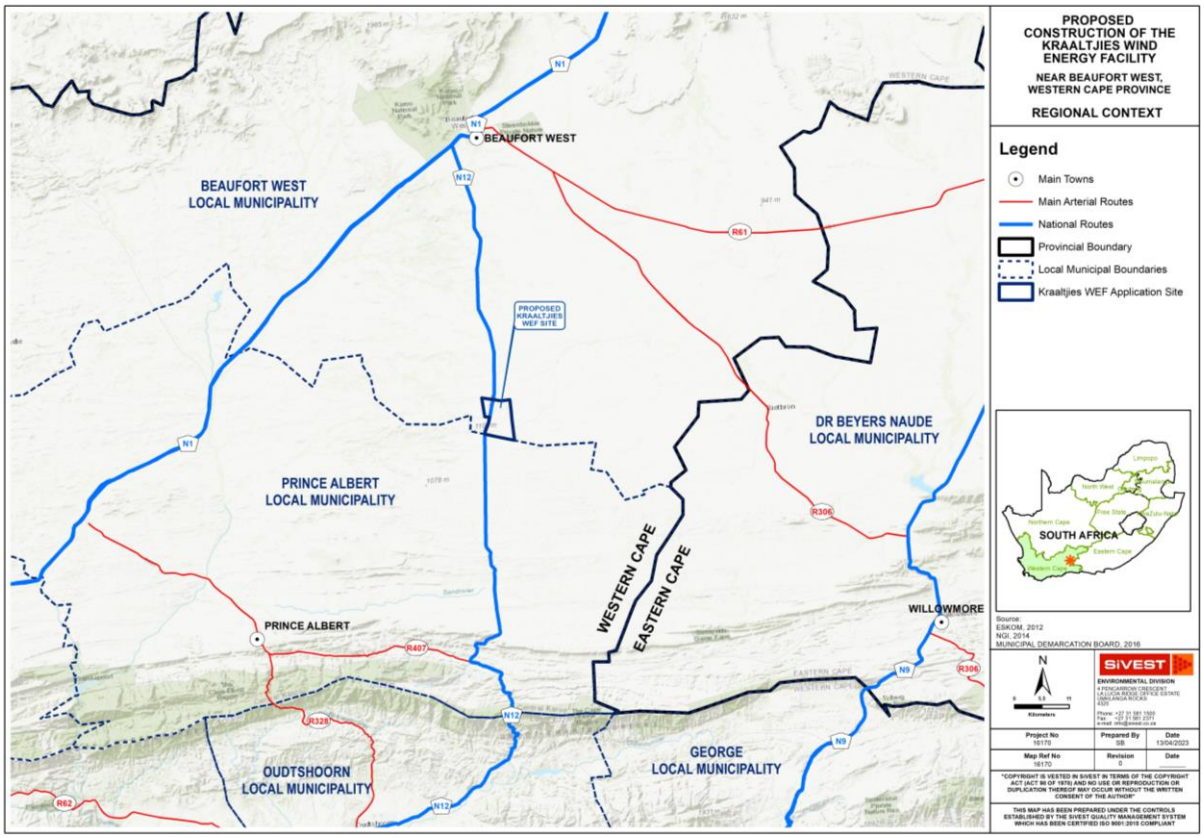


Figure 6.1 Regional Context

The proposed WEF will be located on the following properties (Refer Figure 6.2):

- Portion 10 of the Farm Brits Eigendom No 374;
- Portion 25 of the Farm Brits Eigendom No 374.

As shown in Figure 6.2 below, the proposed Kraaltjies WEF facility and associated infrastructure is located in the Beaufort West and Prince Albert Local Municipality with a facility area of 3960.29 ha in the Central Karoo District Municipality.

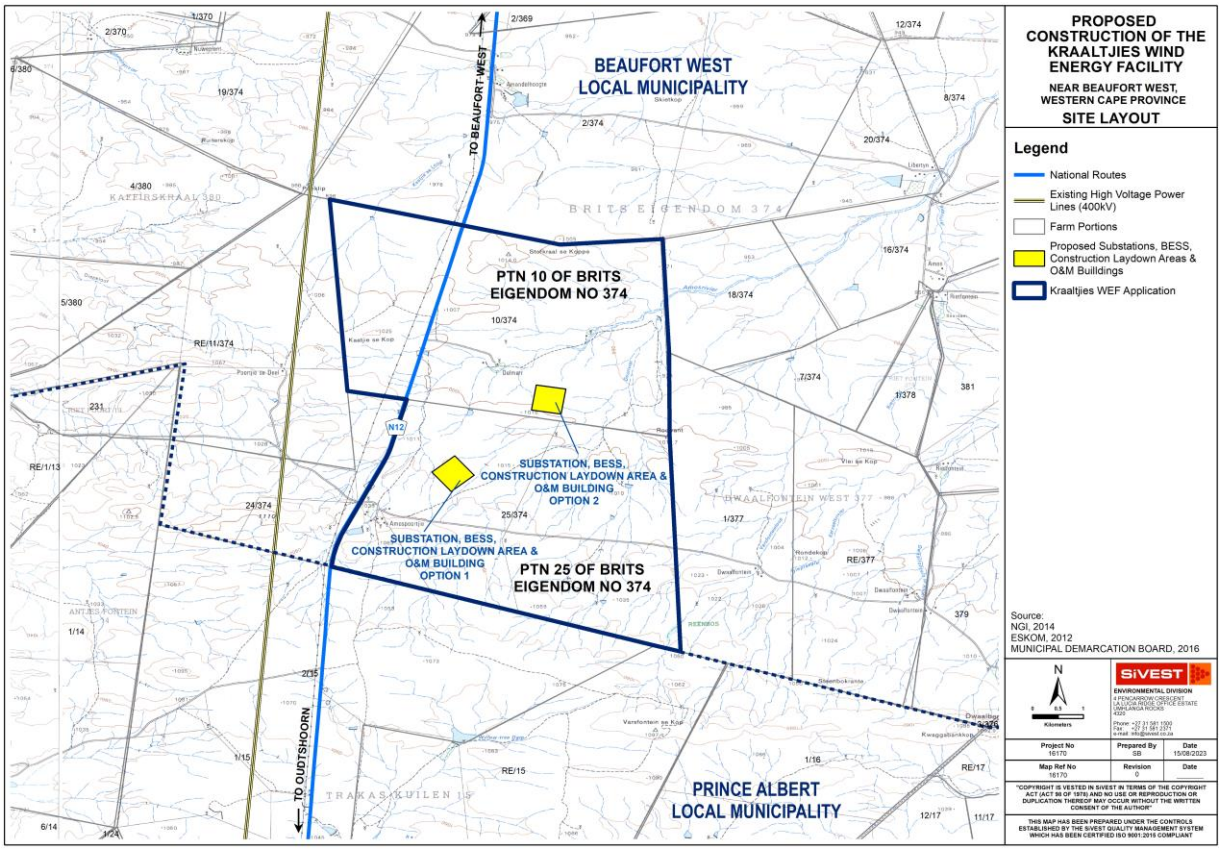


Figure 6.2 Kraaltjies WEF - Site Locality

7. TRANSPORTATION

The Kraaltjies WEF development is bisected by provincial roads and existing access points already exists in the form of farm access points, however, the access for the future facility expansions, will need to be upgraded or moved to new positions in order to accommodate the proposed adjusted land use.

The development is bisected by the surfaced N12 National Road (Road No: TR03305). Road TR03305 is a proclaimed road and falls under the jurisdiction of the Western Cape Provincial Administration.

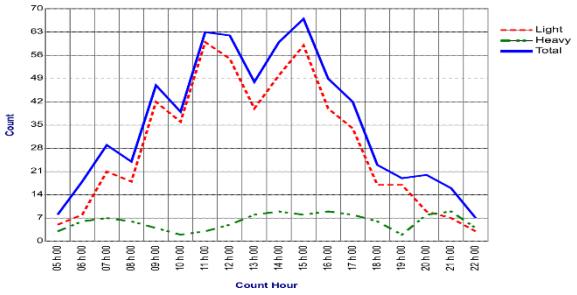
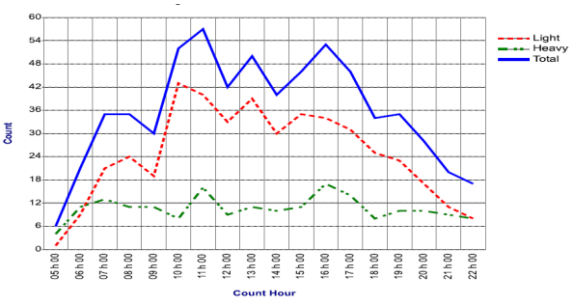
The site and their respective access points and internal layouts will be discussed in more detail in the sections below.

7.1 Existing Traffic Conditions

The Western Cape Provincial Government makes use of a Traffic Counting System (TCS) and has served the Western Cape Provincial Network since 1999. The main emphasis of the system is on Trunk, Main and Divisional roads and at the present time only Minor roads that intersect with more important roads are on the system.

The data indicated below are from two stations on the N12 Freeway, immediately north and south of the proposed development at Km 79.41 and Km 33.23 respectively.

Table 7.1 Traffic Data / Counts

	Light Vehicles	Heavy Vehicles	Total Vehicles	Station Count Chart
N12 @ DR02304 Junction **Km 79.41** **Station No: 2126A** **Date: 12/09/2016**				
Morning 7:00-8:00	19	6	25	
Weekday Midday 10:00-15:00	261	34	295	
Afternoon 16:00-17:00	35	8	43	
Average Annual Daily Trips	629	136	765	
N12 @ DR02301 Junction **Km 33.23** **Station No: 2125C** **Date: 25/10/2017**				
Morning 7:00-8:00	24	11	35	
Weekday Midday 10:00-15:00	177	57	234	
Afternoon 16:00-17:00	31	15	46	
Average Annual Daily Trips	537	240	777	

Based on the table above, it can be concluded that the existing peak traffic on this section of road is a 'Weekday Midday' peak hour traffic between 10:00 – 16:00.

7.2 Additional Traffic Generation

The construction / Balance of Plant phase will typically generate the highest number of trips for the proposed facility. Construction will typically involve access roads, foundations, WTG, electrical cables / transformers / switch gears / substations / BESS installations and the delivery of these materials / equipment / abnormal loads on the public road network.

It is assumed that no staff or labour will reside on the construction site, other than security, and therefore all will reside in nearby towns of Beaufort West or Klaarstroom or alternatively be accommodated in nearby hostels.

7.2.1 Construction Phase

Based on calculations and our experience from previous WEF's, confirm the Balance of Plant (BoP) construction phase will generate the greatest additional traffic to the surrounding road network. The resultant impact will be on the surrounding road network, increasing dust generation, noise and road maintenance.

The BoP period on WEF developments typically take place between month 2 – 18 on a WEF of this size. This development of 20 WTG will generate a maximum of ±93 additional vehicles trips per day on the surrounding road network and will only occur for a period of 1 – 3 months during this period. Of these vehicle trips, ±57 vehicle trips will occur at the peak of the construction phase transporting staff and labour. Typically, these trips will be in the morning between 6:00 – 7:00 and in the afternoons between 16:00 – 17:00. These trips will therefore occur outside of the 'weekday midday' peak period and hence be in the off-peak period.

The remaining ±36 vehicle trips will occur during the 'weekday midday' peak period for the delivery of construction material and abnormal loads. The abnormal loads however only account for ±4 trips of the construction phase and is elaborated further in Section 0 below. Assuming a 9hr work day, the ±32 vehicles during 'weekday midday' peak will equate to ±4 vehicle trips / hour. The resultant impact of this development to the surrounding road network during the construction period, is therefore seen as nominal.

The proposed mitigation measures for the traffic impacts of this phase of the development are:

- Reduction in vehicle speed
- Reduction in dust generation
- Adequate law enforcement
- Appropriate, timely and high quality maintenance of gravel roads
- Implementation of pedestrian safety initiatives
- Regular maintenance of farm fences and access cattle grids
- Continuous engagement with the Western Cape Department of Transport & Public Works (WCDTPW).

7.2.1.1 *Abnormal Loads*

The transportation of abnormal loads from its origin to the proposed facility has been assumed to be primarily from two areas. Based on the route study completed for the adjacent Beaufort West & Trakas WEF the route between the Port of Saldanha and the Kraaltjies WEF is the preferred option. The report also briefly covers the route between Port of Ngqura and the Kraaltjies WEF, but was not assessed in detail as the distance between the two options was ±100km less and therefore not considered.

Examples of the transportation methods for the Tower Sections (Figure 7.1, Nacelle (Figure 7.1), Hub (Figure 7.2) and Rotor Blades (Figure 7.3) have been included below.

The Geometric clearance requirements, associated with these abnormal load transporting the equipment types is shown in Table 7.2. We should however note that the figures indicated are indicative figures as many of the components are still at design stage and will only confirmed closer to time of construction.

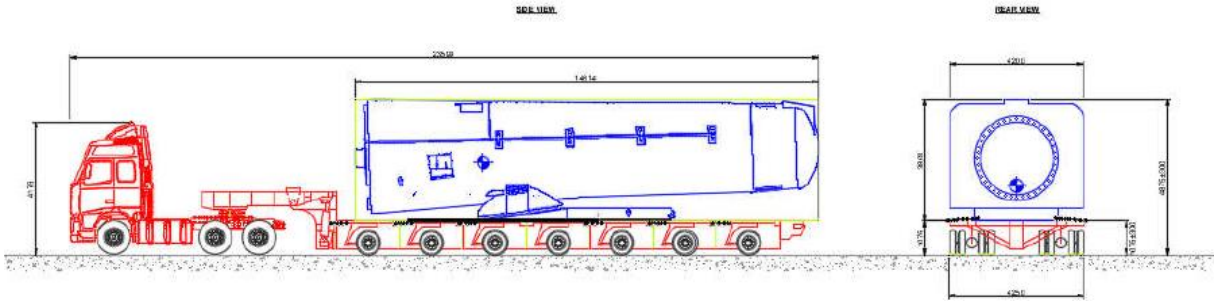


Figure 7.1 Example of Nacelle & Tower

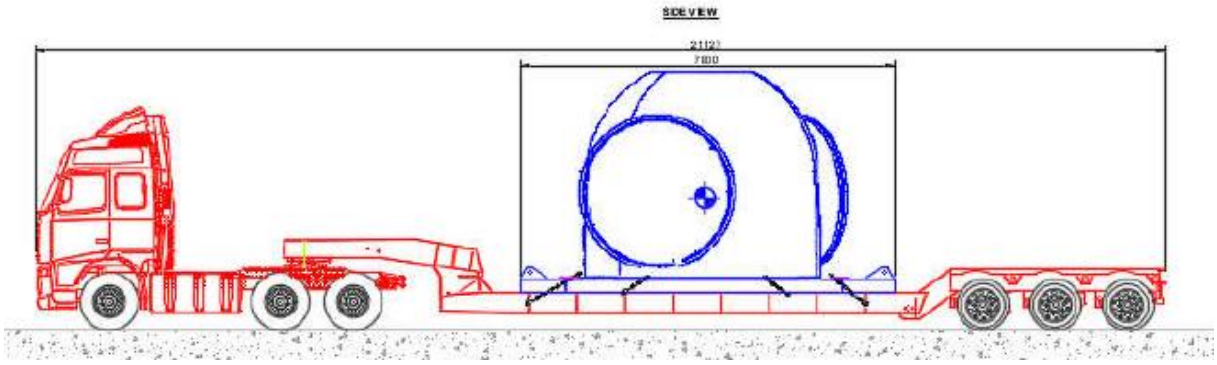


Figure 7.2 Example of Hub

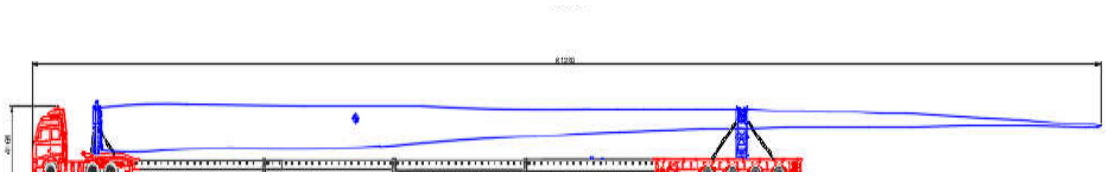


Figure 7.3 Example of Rotor Blades

Table 7.2 Abnormal Load Dimensions

Abnormal Load Dimensions			
Load to be Transported	**Typical Dimensions**		
	Length (m)	**Width (m)**	**Height (m)**
Tower Sections (8 Loads of approximately 13-27m long each dependant on the weight)	29	4.5	4.5
Nacelle (1 per Turbine, transported individually)	12.8	4.2	3.8
Blades (3 per Turbine, transported separately)	100	4	4
Rotor Hub (1 per Turbine, transported individually)	5.5	3.8	3.8

Table 7.3 Abnormal Load Trips

Abnormal Load Trips				
	Month (Period)			Origin
Proposed WTG Delivery Schedule	**1-14**	**14-22**	**22-24**	
Tower Sections	0	4	0	Saldanha
Nacelle				Saldanha
Blades				Saldanha
Rotor Hub				Saldanha
Trips/Day for period	**0**	**4**	**0**	

From the table above it was assumed that 16 trips per WTG or two sets / teams of 3 abnormal loads will transport sections of the WTG to each facility in a four-day period. This equates to a total of 320 trips in a 32-week period (8 months). Even though each set / team of 3 vehicles will deliver simultaneously, ±4 trips per abnormal load will be experienced each day which will include any ancillaries.

Prior to any Abnormal Loads conveying equipment to the facility, approval needs to be obtained in the form of a permit from the Department of Transport (DoT). The permit application will be completed by specialists in the transportation of Abnormal loads and will conform to 'The Road Traffic Act, 1996 (Act No 93 of 1996)'. The application includes route clearances from Telkom and Eskom after which the application is submitted to DoT who intern consults with the SANRAL, Local Municipalities and Provincial Authorities prior to issuing a permit.

7.2.1.2 *Permitting – General Rules*

The limits recommended in *TRH 11 - Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads* 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 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.
- A permit can be withdrawn if the vehicle upon inspection is found in any way not fit to be operated.
- 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.

7.2.1.3 *Proposed Abnormal Load Routes*

The transportation of Abnormal goods has been indicated in **Figure 7.4** below and will be primarily from two ports namely; Saldanha and Ngqura. Based on the route study completed for the adjacent Beaufort West & Trakas WEF, confirms Saldanha port is the preferred point of entry for delivery and to transport Abnormal goods to the Kraaltjies WEF Development.

The report also briefly covers the route between Ngqura and the Beaufort West & Trakas WEF, but was not assessed in detail as the distance between the two options was ±100km less and therefore not considered.

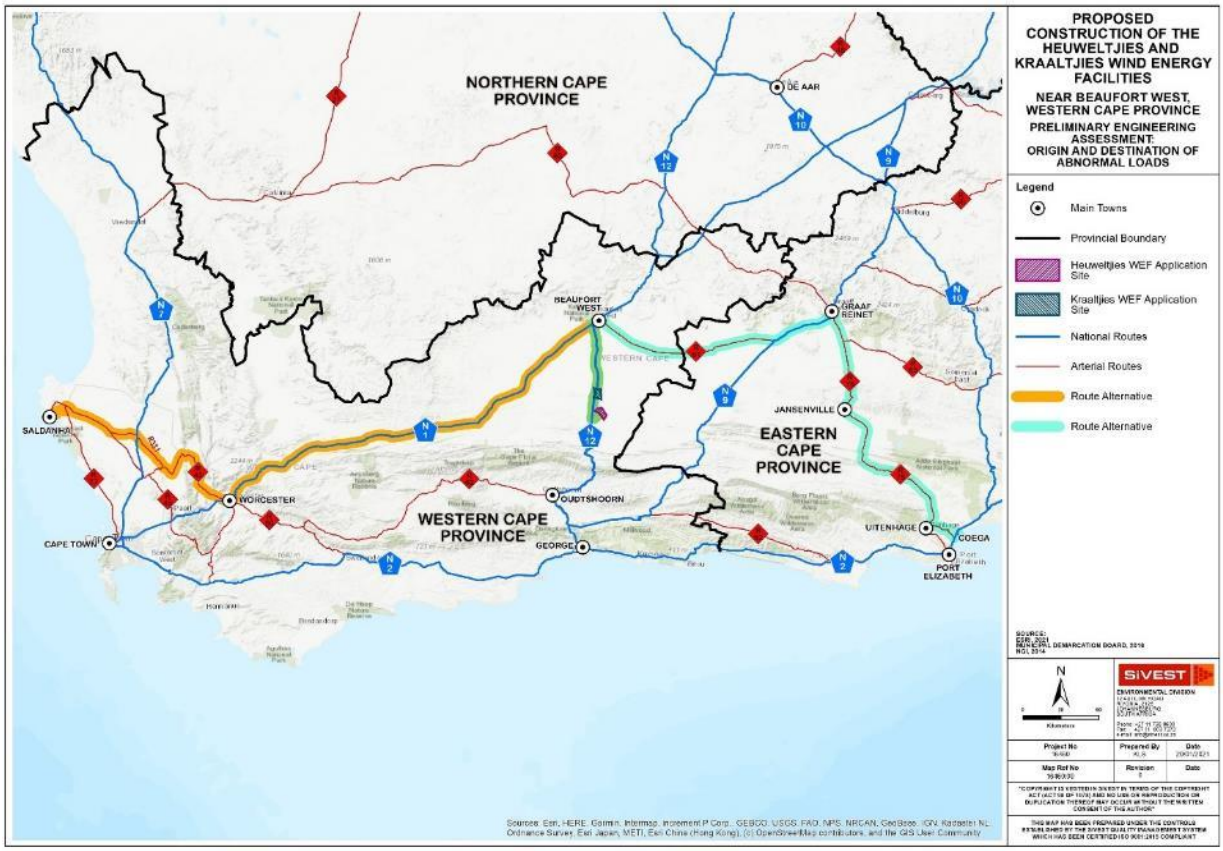


Figure 7.4 Abnormal Load Transport Routes

We recommend that a more comprehensive route analysis be completed prior to construction in order to get a better understanding of the works required and the potential risks.

7.2.2 Operation & Maintenance (O&M)

The Kraaltjies WEF is assumed to have a design horizon of 20 years, which could be increased if financially viable. The O&M during the 20 year period will typically be in the form of a small general maintenance team during the O&M period. Any maintenance which will require inter alia a new nacelle, blade or generator will classify as an abnormal load and the traffic generated by this will be negligible in the greater scheme of the development. The largest contributor of traffic in this phase will therefore only comprise of employees commuting to and from the site.

We assume, a maximum number of ±30 employees will be employed during the 20-year life span of the project. It is therefore assumed that the employees will commute together and hence a total of ±10 additional trips will be added onto the existing road network during the morning and afternoon period. In addition to the staff commuting will be the collection of waste and sanitation. These are assumed to generate an additional ±2 vehicles / week onto the existing road network and therefore the sum of this phase will have a low to negligible impact.

The proposed mitigation measures for the traffic impacts of this phase of the development are:

- Reduction in vehicle speed;
- Reduction in dust generation;
- Adequate law enforcement;
- Appropriate, timely and high quality maintenance of gravel roads;
- Implementation of pedestrian safety initiatives;
- Regular maintenance of farm fences and access cattle grids; and
- Continuous engagement with the Western Cape Department of Transport & Public Works.

7.2.3 Decommissioning Phase

Decommissioning of the Kraaltjies WEF will generate considerably less trips than the construction phase. It is estimated that the decommissioning phase will generate an additional ± 10 vehicles / day over a period of 12 – 18 months. The material removed will be transported back to Cape Town for recycling. The impact of this phase will therefore be low.

The proposed mitigation measures for the traffic impacts of this phase of the development are:

- Reduction in vehicle speed;
- Reduction in dust generated;
- Adequate law enforcement;
- Appropriate, timely and high quality maintenance of gravel roads;
- Implementation of pedestrian safety initiatives;
- Regular maintenance of farm fences and access cattle grids; and
- Continuous engagement with the Western Cape Department of Transport & Public Works.

7.3 Kraaltjies WEF - Access

The Kraaltjies WEF is made up of two farms; - PTN 10 of Brits Eigendom No 374 to the north and PTN 25 of Brits Eigendom No 374 to the south. The N12 freeway (Road No: TR03305) runs north south and bisects PTN 10 of Brits Eigendom No 374 to the west of the farm while the same freeway is located on the western boundary of PTN 25 of Brits Eigendom No 374. Both farms have access points emanating from the N12 freeway.

The N12 freeway is classified as a Class 2 in terms of the RCAM Classification – Minor Arterial and has an average road reserve width of 30m and is surfaced 7.2m wide with a 1.2m wide gravel shoulder on both sides with a design speed of 120km/h.

Various secondary access points exists along the farm boundary of the N12 with the major access point for PTN 10 of Brits Eigendom No 374 located at Km 55.46 as indicated on the image below (**Figure 7.5**). As a result of the minumum prescribed sight distances for access points on Class 2 roads being 400m, the current sight distance of ±240m between the access and the ridge to the south, is sub-standard and therefore will need to be relocated.

Figure 7.5 Existing Access to Portion 10 of Brits Eigendom No 374 – North approaching

Access to PTN 25 of Brits Eigendom No 374 is loacted at Km 51.80 as indicated in Figure 7.6 and Figure 7.7 below. The minimum required stight distance standards applicable to this access is 400m and hence the current sight distance of ±405m between the access and the ridge to the south, is acceptable and therefore can remain in its current position.

Figure 7.6 Existing Access to PTN 25 of Brits Eigendom No 374 – South Approaching

Figure 7.7 Existing Access to PTN 25 of Brits Eigendom No 374 – North Approaching

We propose two alternative access points for this facility. The proposed access points will be to the minimum standards and is strategically placed near the centre of the proposed site. Access to PTN 25 of Brits Eigendom No 374 can therefore remain in its current position @ Km 51.80, however a new access position for PTN 10 of Brits Eigendom No 374 will be required @ Km 54.68 as indicated in Figure 8.1 below.

Upgrades to both access positions will be required and hence approval will need to be obtained from the Western Cape Department of Transport & Public Works.

7.4 Design Considerations

Based on our recent discussions with the WCDTPW, new Land Use applications must be sent for approval to their department with the proposed new / upgraded access positions. As part of the application, the expected traffic during construction and the O&M phase, available sight distances including photographs and the affected stormwater structures are to be included in the application. Both the OEM's and the WCDTPW minimum requirements will need to be taken into account during this stage.

Standard access requirements from the Western Cape Department of Transport & Public Works has been included in Figure 7.8 and Figure 7.9 below.

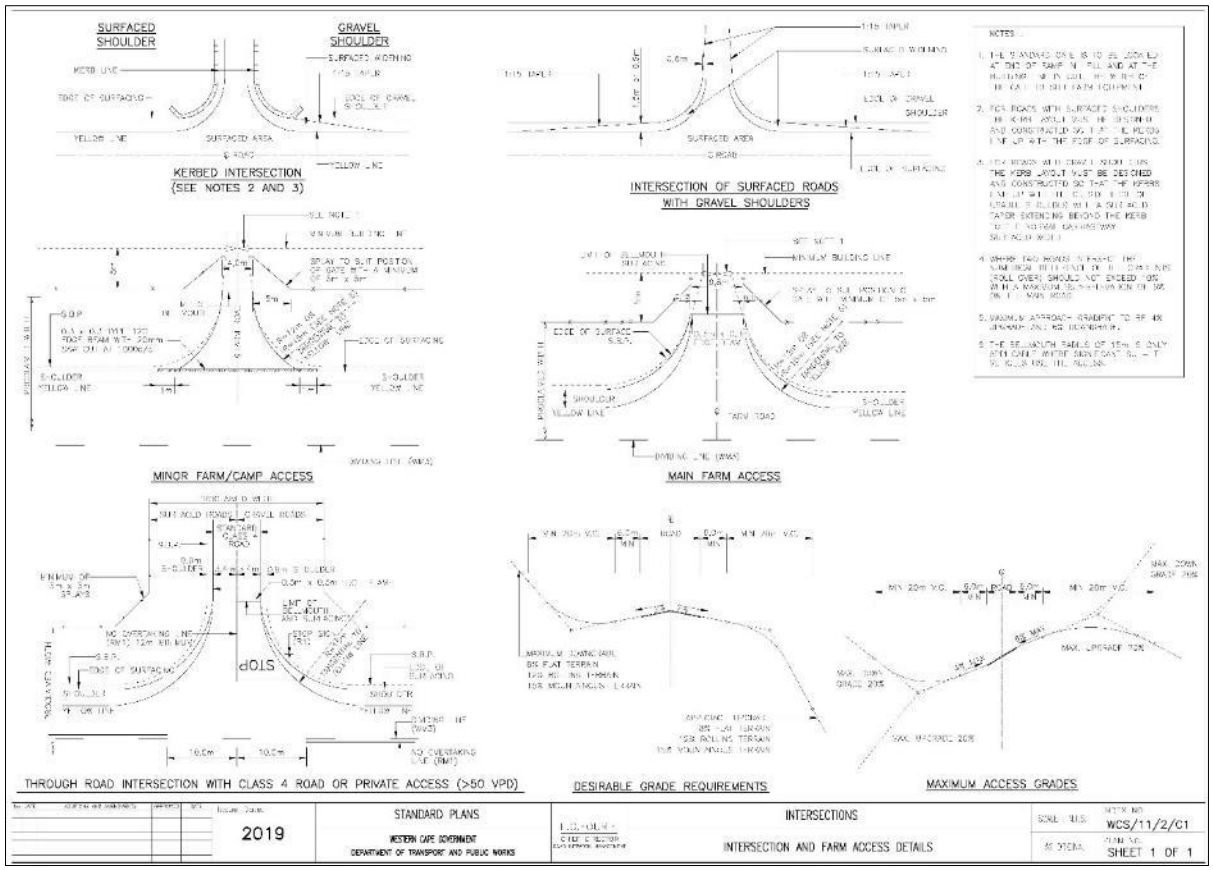


Figure 7.8 Typical Intersection and Farm Access Detail

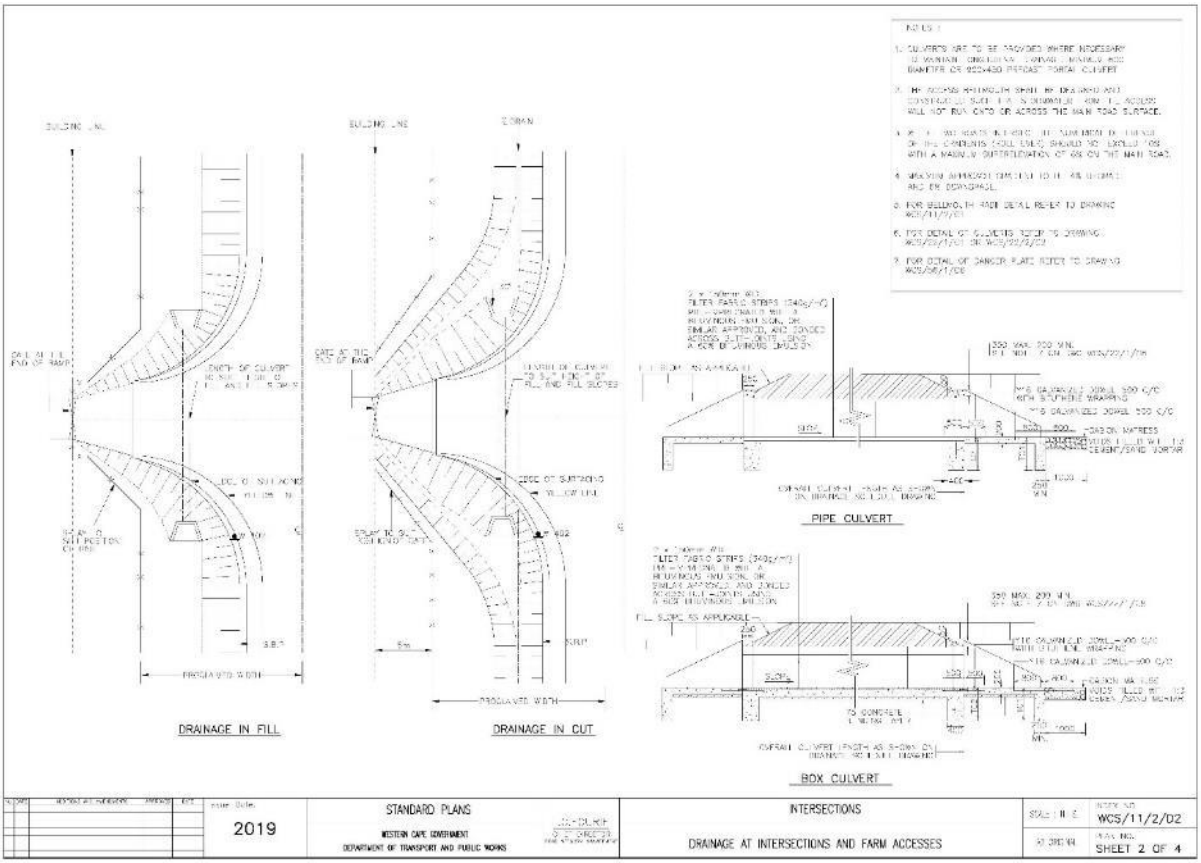


Figure 7.9 Typical Drainage at Intersections and Farm Access

Typical cross sections for provincial gravel roads have been indicated in **Figure 7.10** below and need to take into account the minimum requirements from OEM's.

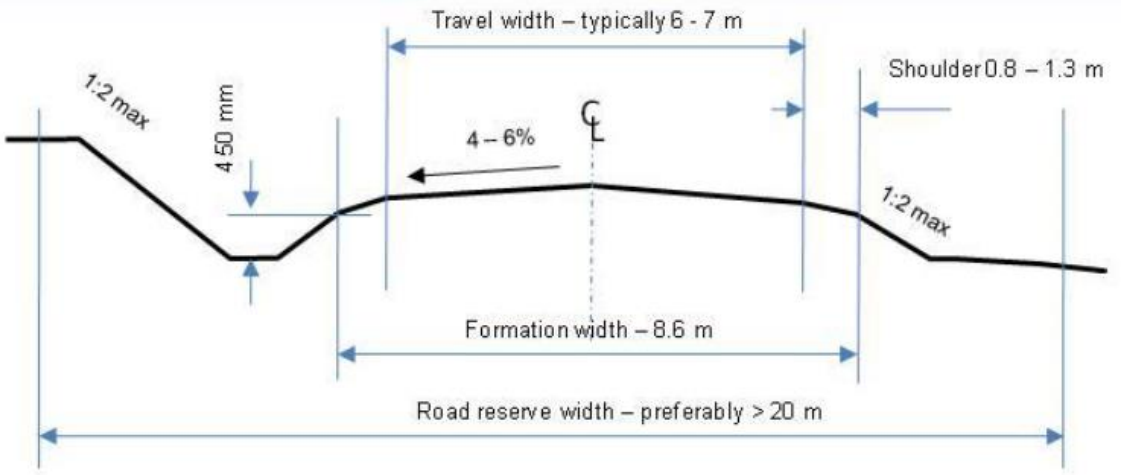


Figure 7.10 Typical Provincial Gravel Road Cross Section

The proposed mitigation measures for the traffic impacts of this phase of the development are:

- Reduction in vehicle speed
- Adequate law enforcement
- Implementation of pedestrian safety initiatives
- Regular maintenance of farm fence, access cattle grids
- Adequate road signage as per the South African Road Traffic Sign Manual (SARTSM) latest edition.
- Possible use of an approved dust suppressant techniques
- Appropriate, timely and high quality maintenance of existing gravel roads in terms of TRH20
- Design and construction of new gravel roads in terms of TRH20
- Continuous engagement with OEM and Abnormal Load specialist
- Continuous engagement with the Western Cape Department of Transport & Public Works

We should however note that the figures indicated above are indicative figures as many of the components are still at design stage and will only be confirmed closer to time of construction.

8. INTERNAL LAYOUTS

The layout of internal infratructure is such that the impact to the environment is kept to a minimum. We therefore propose that a central access to the facility be considered and that all other temporary and permanent builings and construction infrstructure be located close to the access point. Refer Figure 8.1.

We would recommend that all internal access roads take into account where possible and applicable, the PV facility stormwater management plan so as to reduce the risks of possible erosion.

We recommend that all internal access roads are constructed according to *TRH20 – Unsealed Roads: Design Construction and Maintenance.* For the purpose of this assessment, we have assumed that the insitu material below the topsoil is of 'G7' quality and can be used as a suitable road subgrade material, followed by an imported 'Gravel Wearing Course' material.

All internal access roads should be designed to have a minimum impact to the environment and thus are in most cases parallel to the contours and keep drainage line crossings to a minimum. The use of roads perpendicular to the contours for long sections should be avoided, as the risk of possible erosion is increased. Existing gravel roads should also be used to reduce the overall impact on the environment.

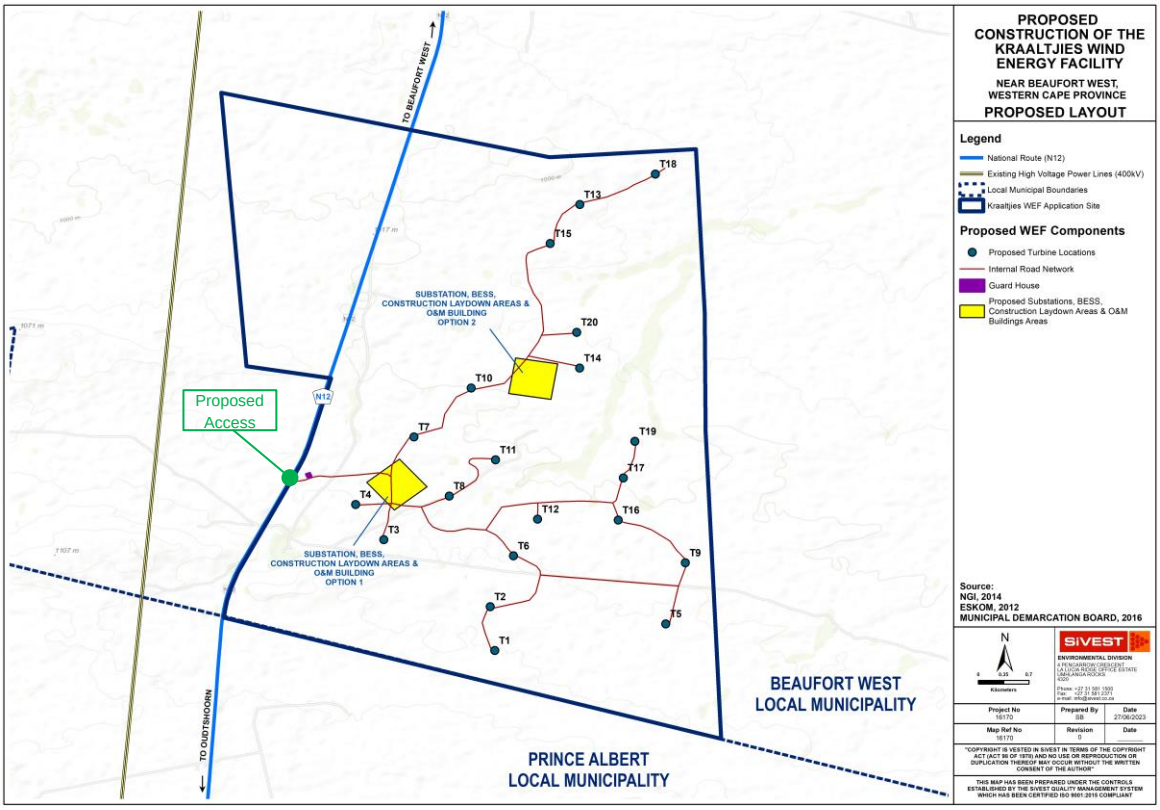


Figure 8.1 Kraaltjies WEF - Internal Layouts also showing site access point

An internal network of minimum 5m wide gravel roads will connect all the WTG and ancillary equipment to each other. The roads will have a horizontal and vertical alignment to accommodate vehicles and more specifically abnormal vehicles intended to use these roads for the delivery of the WTG equipment. A typical intersection and horizontal alignment would consist of radii and clearances similar to the requirements in Figure 7.8. It is nonetheless recommended that manoeuvrability simulations be carried out in the detail design phase.

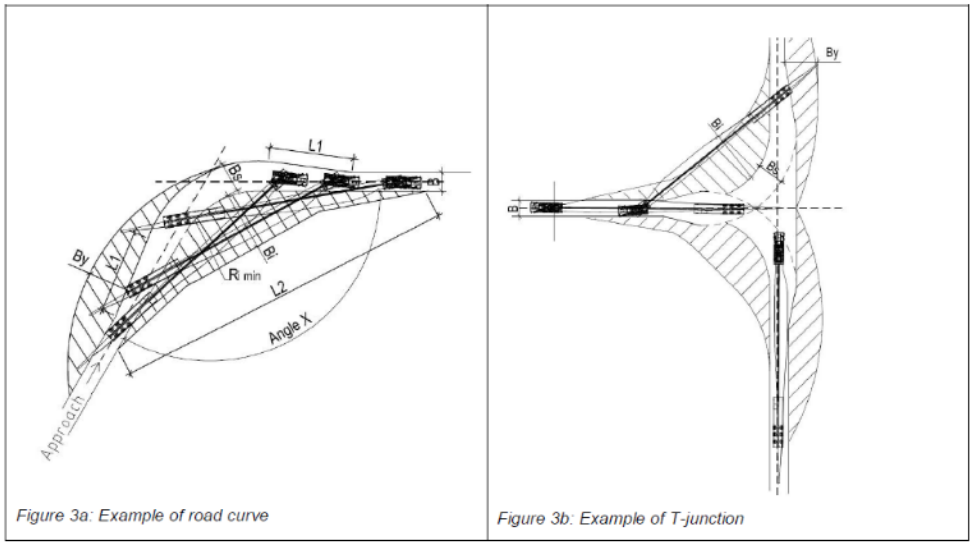


Figure 3a: Example of road curve

Figure 3b: Example of T-junction

The hatched areas on the figure are areas that the Employer shall clear of obstacles and level to allow overhang.

Angle X	$R_{i\,min}$	B_y	B_s	B_i	L_1	L_2
160°	14 m	4 m	4,5 m	3 m	10 m	35 m
120°	28 m	6 m	5 m	5 m	12 m	40 m
90°	38 m	7 m	7 m	6 m	18 m	52 m

Figure 8.2 Typical Horizontal Design Standards for a 101m Rotor Diameter

9. IMPACT RATING ASSESSMENT

The 'Impact Rating System' takes into account the nature, scale and duration of the effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages:

- Planning
- Construction
- Operation
- Decommissioning

A rating points-based system is applied to the potential impacts on the environment and includes objective evaluations of the mitigation of the impact. These impacts can be found in Table 9.1 below.

In summary, all impacts were classified as 'Low or Medium' impacts and remain 'Low to Medium' after the implementation of suitable mitigation measures. This rating is applicable to all alternatives considered.

Table 9.1 Kraaltjies – Impact Rating Table

KRAALTJIES WIND ENERGY FACILITY																					
ENVIRONMENTAL PARAMETER	**ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE**	**ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION**									**RECOMMENDED MITIGATION MEASURES**	**ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION**								
		E	**P**	**R**	**L**	**D**	**I / M**	**TOTAL**	**STATUS (+ OR -)**	**S**		**E**	**P**	**R**	**L**	**D**	**I / M**	**TOTAL**	**STATUS (+ OR -)**	**S**
Construction Phase																					
Additional Traffic Generation	Increase in Traffic	2	4	1	2	1	3	30	-	Medium	• Ensure staff transport is done in the 'off peak' periods and by bus as far as practically possible. • Stagger material, component and abnormal loads delivery as far as practically possible. • Construction of an on-site batching plant and tower construction to reduce trips, where required and if practically possible.	2	4	1	2	1	2	20	-	Low
	Increase of Incidents with pedestrians and livestock	2	4	2	4	1	2	26	-	Medium	• Upgrade of existing / new access points • Reduction in speed of vehicles • Adequate enforcement of the law • Implementation of pedestrian safety initiatives • Regular maintenance of farm fences & access cattle grids where and if required. • Construction of an on-site batching plant and tower construction to reduce trips where required and if practically possible.	2	3	2	4	1	1	12	-	Low
	Increase in Dust from gravel roads	2	3	2	2	1	2	20	-	Low	• Upgrade of existing / new access point • Reduction in speed of the vehicles • Construction of gravel roads in terms of TRH20 • Implement a road maintenance program under the auspices of the respective transport department. • Possible use of an approved dust suppressant techniques, where required and if practically possible. • Construction of an on-site batching plant and tower construction to reduce trips where required and if practically possible.	2	3	2	2	1	2	20	-	Low
	Increase in Road Maintenance	2	3	2	2	2	2	22	-	Low	• Implement a road maintenance program under the auspices of the respective transport department. • Construction of an on-site batching plant and tower construction to reduce trips where required and if practically possible.	2	3	2	2	1	2	20	-	Low
Abnormal Loads	Additional Abnormal Loads	3	2	1	2	1	1	9	-	Low	• Ensure abnormal vehicles travel to and from the proposed development in the 'off peak' periods or stagger delivery as far as practically possible. • Adequate enforcement of the law	3	2	1	2	1	1	9	-	Low

Internal Access Roads	Increase in Dust from gravel roads	1	4	1	1	1	2	16	-	Low	• Enforce a maximum speed limit on the development • Appropriate, timely and high quality maintenance required in terms of TRH20 • Possible use of an approved dust suppressant techniques, where required and if practically possible.	1	3	1	1	1	2	14	-	Low
	New / Larger Access points	1	4	1	2	1	1	9	-	Low	• Adequate road signage according to the SARTSM. • Approval from the respective roads department	1	4	1	2	1	1	9	-	Low
Operational Phase																				
Additional Traffic Generation	Increase in Traffic	2	1	1	2	3	1	9	-	Low	• The increase in traffic for this phase of the development is negligible and will not have a significant impact	2	1	1	2	3	1	9	-	Low
	Increase of Incidents with pedestrians and livestock	2	1	1	2	3	1	9	-	Low	• The increase in traffic for this phase of the development is negligible and will not have a significant impact	2	1	1	2	3	1	9	-	Low
	Increase in Dust from gravel roads	2	1	1	2	3	1	9	-	Low	• The increase in traffic for this phase of the development is negligible and will not have a significant impact	2	1	1	2	3	1	9	-	Low
	Increase in Road Maintenance	2	1	1	2	3	1	9	-	Low	• The increase in traffic for this phase of the development is negligible and will not have a significant impact	2	1	1	2	3	1	9	-	Low
Abnormal Loads	Additional Abnormal Loads	3	1	1	2	3	1	10	-	Low	• The increase in traffic for this phase of the development is negligible and will not have a significant impact	3	1	1	2	3	1	10	-	Low
Internal Access Roads	New / Larger Access points	1	1	1	2	3	1	8	-	Low	• Adequate road signage according to the SARTSM	1	1	1	2	3	1	8	-	Low
Decommissioning Phase																				
Additional Traffic Generation	Increase in Traffic	2	4	1	2	1	3	30	-	Low	• Ensure staff transport is done in the 'off peak' periods and by bus as far as practically possible. • Stagger material, component and abnormal loads delivery as far as practically possible.	2	4	1	2	1	2	20	-	Low
	Increase of Incidents with pedestrians and livestock	2	4	2	4	1	2	26	-	Medium	• Reduction in speed of vehicles • Adequate enforcement of the law • Implementation of pedestrian safety initiatives • Regular maintenance of farm fences & access cattle grids, where and if required.	2	3	2	4	1	1	12	-	Low
	Increase in Dust from gravel roads	2	3	2	2	1	2	20	-	Low	• Reduction in speed of the vehicles • Appropriate, timely and high quality maintenance required in terms of TRH20 • Possible use of an approved dust suppressant techniques where required and if practically possible. • Implement a road maintenance program under the auspices of the respective transport department. • Construction of an on-site batching plant and tower construction to reduce trips where required and if practically possible.	2	3	2	2	1	2	20	-	Low
	Increase in Road Maintenance	2	3	2	2	2	2	22	-	Low	• Implement a road maintenance program under the auspices of the respective transport department.	2	3	2	2	1	2	20	-	Low

Abnormal Loads	Additional Abnormal Loads	3	2	1	2	1	1	9	-	Low	• Ensure abnormal vehicles travel to and from the proposed development in the 'off peak' periods or stagger delivery. • Adequate enforcement of the law	3	2	1	2	1	1	9	-	Low
Internal Access Roads	Increase in Dust from gravel roads	1	4	1	1	1	1	8	-	Low	• Enforce a maximum speed limit on the development • Appropriate, timely and high quality maintenance required in terms of TRH20 • Possible use of an approved dust suppressant techniques where required and if practically possible	1	3	1	1	1	2	14	-	Low
	New / Larger Access points	1	4	1	2	1	1	9	-	Low	• Adequate road signage according to the SARTSM • Approval from the respective roads department	1	4	1	2	1	1	9	-	Low
Cumulative																					
Additional Traffic Generation	Increase in Traffic	2	4	1	2	1	4	40	-	Medium	• Ensure a large portion of vehicles traveling to and from the proposed development travels in the 'off peak' periods or by bus as far as practically possible. • Construction of an on-site batching plant and tower construction to reduce trips where required and if practically possible. • Co-ordination between all developers in the area as far as practically possible	2	4	1	2	1	3	30	-	Medium
	Increase of Incidents with pedestrians and livestock	2	4	2	4	1	3	39	-	Medium	• Reduction in speed of vehicles • Adequate enforcement of the law • Implementation of pedestrian safety initiatives • Regular maintenance of farm fences, access cattle grids where and if required • Construction of an on-site batching plant and tower construction to reduce trips where required and if practically possible. • Coordination between all developers in the area as far as practically possible	2	3	2	4	1	2	24	-	Medium
	Increase in Dust from gravel roads	2	3	2	2	1	4	40	-	Medium	• Reduction in speed of the vehicles • Construction of gravel roads in terms of TRH20 • Implement a road maintenance program under the auspices of the respective transport department. • Possible use of an approved dust suppressant techniques where required and if practically possible • Construction of an on-site batching plant and tower construction to reduce trips where required and if practically possible. • Coordination between all developers in the area as far as practically possible.	2	3	2	2	1	2	20	-	Low
	Increase in Road Maintenance	2	3	2	2	2	2	22	-	Low	• Implement a road maintenance program under the auspices of the respective transport department. • Construction of an on-site batching plant and tower construction to reduce trips where required and if practically possible. • Coordination between all developers in the area as far as practically possible.	2	3	2	2	2	2	22	-	Low

Abnormal Loads	Additional Abnormal Loads	3	2	1	2	1	4	36	-	Medium	• Ensure abnormal vehicles travel to and from the proposed development in the 'off peak' periods. • Adequate enforcement of the law • Coordination between all developers in the area as far as practically possible.	3	2	1	2	1	2	18	-	Low
Internal Access Roads	Increase in Dust from gravel roads	1	4	1	1	1	3	24	-	Medium	• Enforce a maximum speed limit on the development • Appropriate, timely and high quality maintenance required in terms of TRH20 • Possible use of an approved dust suppressant techniques where required and if practically possible	1	3	1	1	1	2	14	-	Low
	New / Larger Access points	1	4	1	2	1	2	18	-	Low	• Adequate road signage according to the SARTSM • Approval from the respective roads department	1	4	1	2	1	1	9	-	Low

10. CUMULATIVE IMPACT ASSESSMENT

SiVEST undertook every effort to obtain the information (including specialist studies, BA / EIA / Scoping and EMPr Reports) for the surrounding developments within 35 km of the proposed WEF facility, however many of the documents are not currently, publicly available. To this extent, the information that could be obtained from the surrounding, planned renewable energy developments was taken into account as part of the cumulative impact assessment. Five (5) renewable energy projects were identified within a 35 km radius of the proposed development as shown in Table 10.1 below. The renewable energy developments considered as part of this Transportation Study are as follows:

Table 10.1 Proposed Renewable Energy developments within a 35km radius.

Applicant	Project	Technology	Capacity	Status of Application / Development
Proposed Beaufort West Wind Farm	12/12/20/1784/1	Wind	140MW	Approved
Proposed Trakas Wind Farm	12/12/20/1784/2	Wind	140MW	Approved
Proposed Wind and Solar Facility on the Farm Lombardskraal 330	14/12/16/3/3/2/406	Wind & Solar	20MW	EIA in Process
Proposed Leeu Gamka Solar Power Plant	12/12/20/2296	Solar	-	EIA in Process
Proposed Heuweltjies WEF	TBA	Wind	140MW	EIA in Process

The information obtained for other planned renewable energy developments in the surrounds is indicated in Figure 10.1 below.

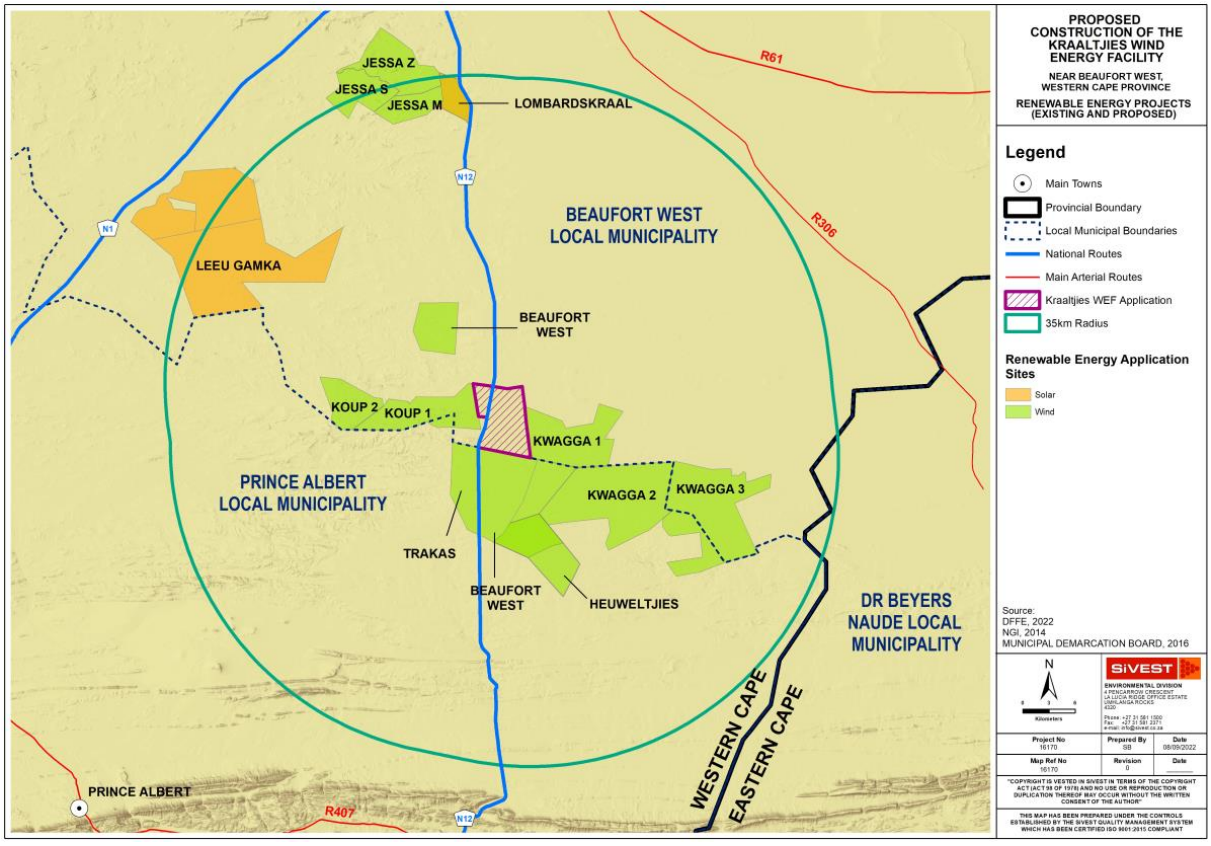


Figure 10.1 Proposed Renewable Energy Developments within a 35km radius

Based on the above this Transportation Study has taken the cumulative impacts into consideration and the impacts were further assessed in Section 10 above.

11. COMPARITIVE ASSESSMENT OF ALTERNATIVES

Design and layout alternatives were considered and assessed as part of the Transportation Study. These include alternatives for the Construction Laydown and Substation locations. The various alternatives, as shown in Figure 8.1 are described below.

Table 11.1 Comparative Assessment Key

PREFERRED	The alternative will result in a low impact / reduce the impact / result in a positive impact
FAVOURABLE	The impact will be relatively insignificant
LEAST PREFERRED	The alternative will result in a high impact / increase the impact
NO PREFERENCE	The alternative will result in equal impacts

Table 11.2 Comparative Assessment of Alternatives: WEF Infrastructure

Alternative	Preference	Reasons (incl. potential issues)
SUBSTATION SITE ALTERNATIVES		
Substation Option 1 Substation Option 2	No Preference	Will not influence the transportation study
CONSTRUCTION LAYDOWN AREA SITE ALTERNATIVES		
Construction Laydown Area Option 1 Construction Laydown Area Option 2	No Preference	Will not influence the transportation study
BATTERY ENERGY STORAGE SYSTEM		
BESS Option 1 BESS Option 2	No Preference	Will not influence the transportation study

11.1 Wind Energy Facility

Design and layout alternatives will be considered and assessed as part of the EIA. These include alternatives for the Substation locations and also for the construction / laydown area. The proposed site alternatives are shown in Figure 8.1.

11.2 No-Go Alternative

The 'no-go' alternative is the option of not undertaking the proposed WEF development. Hence, if the 'no-go' option is implemented, there would be no development. This alternative would result in no environmental impacts from the proposed project on the site or surrounding local area. It provides the baseline against which other alternatives are compared and will be considered throughout the report.

12. CONCLUSIONS AND IMPACT STATEMENT

Based on the information received and the foregoing results concluded, our summary of conclusions are as follows:

- In conclusion;
    - The Kraaltjies Wind Energy Facility consists of one EIA application while the grid connection infrastructure will be undertaken as a separate BA application.
    - The construction phase or Balance of Plant phase of this development will typically generate the highest number of additional vehicles. It will however be temporary and impacts are considered to be nominal.
    - During the operation phase, it is expected that the facility will accommodate ±30 employees which will generate an additional ±10 trips / day in the morning and afternoon peak period. This impact is considered to be nominal.
    - The existing access onto PTN 25 of Brits Eigendom No 374 from the N12 freeway (Road TR03305) @ Km 51.80 has sufficient sight distance in both directions and hence an upgrade of the existing access will be required and a wayleave application to the WCDTPW.
    - The existing access onto PTN 10 of Brits Eigendom No 374 from the N12 freeway (Road TR03305) @ Km 55.46 does not have sufficient sight distance to the south and hence will require relocation. A new access position @ Km 54.68 is proposed and hence approval and a wayleave application will be required from the WCDTPW prior to work commencing.
    - Since large WTGs are planned for this facility, we recommend that the maneuverability of WTG components in and around the site be simulated once additional information becomes available.
    - We recommend that a more comprehensive route analysis be completed prior to construction in order to get a better understanding of the works required and the potential risks.
    - The mitigation measures specified in the preceding sections should be integrated in the Environmental Management Programme (EMPr) for all applicable phases of the project.
    - The ‘No Go’ alternative would result in there being no transportation impacts.
    - No fatal flaws or preferences were identified for any of the proposed site alternatives for construction laydown areas or substation locations.
    - No environmentally sensitive areas in terms of transportation were identified and therefore no areas are to be avoided from a Transportation perspective.

- Impact Statement;
    - With reference to this report, associated assessment and the findings made within, it is SiVEST’s opinion that the Kraaltjies Wind Energy Facility and associated infrastructure will have a nominal impact on the existing traffic network. The project is therefore deemed acceptable from a transport perspective, provided the recommendations and mitigations measures in this report are implemented, and hence the Environmental Authorisations (EAs) should be granted for the EIA application.

13. REFERENCES

KZN Transport – *Concrete Causeway Details (1996)*

South African National Roads Agency Limited – *Drainage Manual (5th Edition)*

American Association of State Highway Transportation Officials - *Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT ≤ 400) (2001)*

Technical Recommendations for Highways (TRH11) – *Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads (7th Edition - 2000)*

Technical Recommendations for Highways (TRH17) – *Geometric Design of Rural Roads (1988)*

Technical Recommendations for Highways (DRAFT-TRH20) – *Unsealed Roads: Design, Construction and Maintenance (2013)*

Technical Recommendations for Highways (TRH26) – *South African Road Classification and Access Management Manual (2012)*

Western Cape Government Department Transport and Public Works – *Road Network Information System*

Western Cape Government Department Transport and Public Works – *Gravel Roads Manual*

APPENDIX A: SPECIALIST CURRICULUM VITAE

APPENDIX B: SPECIALIST DECLARATION

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