iWink Consulting
Traffic & Transport Engineering
Road Safety

PROPOSED RHINO SOLAR PHOTOVOLTAIC FACILITY (on Remainder of Farm Rhenosterkop 155) & PROPOSED SUNNYSIDE SOLAR PHOTOVOLTAIC FACILITY (on Farm 400)

WESTERN CAPE PROVINCE

Traffic Impact Assessment

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Final Issue

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EXECUTIVE SUMMARY

This report serves as the Traffic Impact Assessment (TIA) aimed at determining the traffic impact of the proposed Rhino Solar Photovoltaic (PV) Facility and Sunnyside Solar PV Facility near Beaufort West in the Western Cape Province. The proposed Rhino PV project site is located approximately 24 km north-east and the proposed Sunnyside PV project sites approximately 22 km east of Beaufort West. The complete Rhenosterkop PV project will comprise up to 500 MW.

The two solar project sites will be located approximately 10km from each other and respectively accommodate a solar power facility and associated support structures and facilities to allow for the generation and evacuation of electricity.

Feasible accessibility was assessed considering sight lines, access spacing requirements and road safety aspects and are discussed in this report. It is recommended to ensure that the access points are kept clear of vegetation and any other obstructions to ensure sight lines are kept.

In general, non-motorised transportation (NMT) is a dominant mode of transportation in rural areas, with private cars and minibus/taxis being the second-most used mode of transport, followed by buses. Currently, there are no known future planned public transport facilities in the vicinity of the site. However, generally the appointed contractor of a renewable energy project will provide either shuttle busses or accommodation on site for workers during the construction phase.

The highest trip generator for the proposed projects is expected during the construction phase. 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. The traffic impact during the operational phase is considered negligible.

For the construction 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. Based on the high-level screening of impacts and mitigation, the proposed project is expected to have a negative low impact during the construction and decommissioning stages including the recommended mitigation measures.

PROPOSED
RHINO SOLAR PV FACILITY
(ON REMAINDER OF FARM RHENOSTERKOP 155) &
SUNNYSIDE SOLAR PV FACILITY (ON FARM 400)

1 INTRODUCTION

1.1 Project Description

K2022578692 South Africa (Pty) Ltd is proposing the development of the Rhino and Sunnyside commercial solar energy generation facility and associated infrastructure on farms located near Beaufort West in the Western Cape Province. The proposed project sites will be located in a rural environment around 20 km to the east and north-east of Beaufort West and comprise of a contracted capacity of up to 500 MW (see **Figure 1-1**).

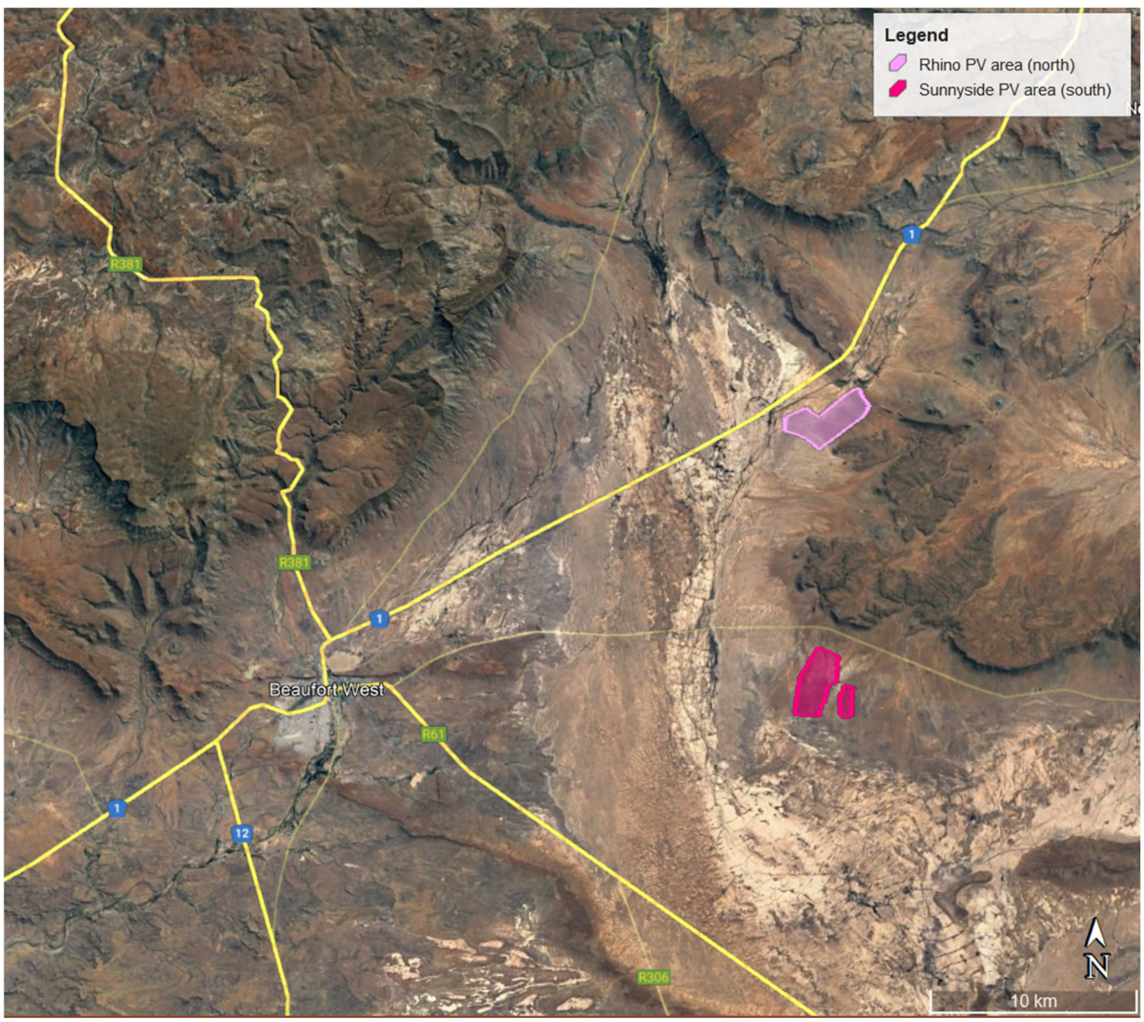

Figure 1-1: Aerial View of Rhino and Sunnyside PV site location

Development areas have been identified and within these identified development areas, the development footprints have been defined in a manner which has considered the environmental sensitivities present on the affected properties and intentionally remains outside of highly sensitive areas.

The proposed solar PV facility and associated infrastructure will be situated within a Renewable Energy Development Zone (REDZ), namely Zone 11 – Beaufort West.

The proposed project details are summarized in **Table 1-1.**

Table 1-1:Project information

Facility Name:	Rhino & Sunnyside Solar PV Facility
Applicant:	K2022578692 South Africa (Pty) Ltd.
Farm property:	Remainder of Farm Rhenosterkop 155 (Rhino Solar PV) Farm 400 (Sunnyside Solar PV)
Province:	Western Cape
Capacity:	Up to 250 MW each – total 500 MW
Extent:	Rhino PV: 4 247ha (563ha for development) Sunnyside PV: 4 035ha (525.2 for development)
Number of panels:	Estimated 500 000 panels each – total 1 000 000 panels
Type of Technology:	Mono- or bifacial panels (photovoltaic)
Structure orientation:	It is expected that the panels will consist of crystalline silicon and can be either: ▪ Fixed to a single-axis horizontal tracking structure where the orientation of the panel varies according to the time of the day, as the sun moves from east to west or tilted at a fixed angle towards North with the angle of tilt optimised for cost and system performance; or ▪ Constructed at a fixed tilt – north facing at a defined angle or tilt.
BESS:	The technology and capacity will still be determined. Typically, either Lithium Battery (such as Lithium Iron Phosphate or Lithium Nickel Manganese Cobalt oxides) or Vanadium Redox technology is considered for a project of this nature. The main components of the BESS include the batteries, power conversion system and transformer which is assumed to be stored in various rows of containers.
Inverter:	Sections of the PV array will need to be wired to inverters. The inverter is generally a pulse width mode inverter that converts direct current (DC) electricity to alternating current (AC)

	electricity at grid frequency. Cabling will comprise communication, AC and DC cables.
Construction Camp and Laydown area:	One construction camp with temporary containers occupying approximately 1 ha. The 1 ha construction camp will become the operational site camp offices, workshop areas, operation and maintenance (O&M) building, permanent parking area, storage area, etc. Temporary construction laydown/staging areas will be located within development area. Footprint: ~2ha.
Internal Roads:	Internal roads need to be provided to the site and between project components inclusive of stormwater infrastructure. As far as possible, internal roads should follow existing gravel roads and paths, of which some may require widening/upgrading. Further internal roads will need to be constructed with a minimum width of 4m (preferable 5m). The total length of internal roads needs to be confirmed. The site access roads recommended to provide 6-8 m width. Where/if required, for turning circle/bypass areas will need to be constructed.
Fencing height/length:	Up to 3m height/11.5 km length per project/ triple wire electric
Substation:	Rhino Solar PV and Sunnyside Solar PV will comprise: ▪ One 132kV substation to step up voltage from 33kV to 132kV ▪ Various transformers to be located within the PV area. These will combine the power from multiple inverters and step up the supply voltage from 800 volts to 33kV. The expected capacity of these transformers is in the range of 2.5 megavolt ampere each, after which the power will be evacuated into the national grid.
Cabling/IPP/Electrical Infrastructure:	Medium voltage cabling will link the PV installation with the grid connection infrastructure at 33 kV. The grid connection infrastructure will step up the voltage to 132 kV high voltage and will be dealt with in a separate Basic Assessment process.
Grid connection:	Both solar PV facilities are planned to connect to a new Main Transmission Substation (MTS), which will be established near the project sites. The new MTS will tie in via loop-in-loop-out connection to the existing Droërivier/Hydra 400 kV lines. Alternatively, the projects can tie into the existing Droërivier MTS via a 132kV connection.
Boreholes and storage tanks:	Existing boreholes have been tested and will inform which boreholes can be used for water provisions. Water will then be stored on site using jojo tanks to store borehole or municipal water.
Site access:	Rhino PV: Via N1 and farm roads Sunnyside PV: Via R61 and farm roads

1.2 Scope and Objectives

The Transport Impact Assessment (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 any future road planning proposals;
- Trip generation for the proposed development during the construction, operation, and decommissioning phases of the facility;
- Anticipated traffic impact of the proposed development;
- Access requirements and feasibility of proposed access points;
- Determine a main route for the transportation of components to the proposed project site;
- Determine a preliminary transportation route for the transportation of materials, equipment and people to site;
- Recommend alternative or secondary routes, where possible and required;
- Assess Public Transport accessibility;
- Assess Non-motorised Transport availability; and
- Recommended high-level upgrades to the road network, if necessary.

1.3 Details of Specialist

Iris Sigrid Wink of iWink Consulting (Pty) Ltd. is the Traffic & Transportation Engineering Specialist appointed to undertake a Traffic Impact Assessment for the proposed Rhino and Sunnyside Solar PV Facility. Iris Wink is registered with the Engineering Council of South Africa (ECSA), with Registration Number 20110156. A curriculum vitae is included in **Appendix A** of this report.

A signed Specialist Statement of Independence is included in **Appendix B**.

1.4 Terms of Reference

There is no protocol relevant to traffic impact assessments and therefore the specialist study is undertaken according to Appendix 6 of the Environmental Impact Assessment Regulations 2014, as amended. A transport specialist report should contain the following:

(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;

(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;

(c) an indication of the scope of, and the purpose for which, the report was prepared;
  (cA) an indication of the quality and age of base data used for the specialist report
  (cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;

(d) the duration date and season of the site investigation and the relevance of the season to the outcome of the assessment;
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;
(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;
(g) an identification of any areas to be avoided, including buffers;
(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;
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;
(k) any mitigation measures for inclusion in the EMPr;
(l) any conditions for inclusion in the environmental authorisation;
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;
(n) a reasoned opinion-
    (i) whether the proposed activity, activities or portions thereof should be authorised; and (considering impacts and expected cumulative impacts).
    (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, 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;
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and
(q) any other information requested by the competent authority.

Specific:

- Extent of the transport study and study area;
- The proposed development;
- Trip generation for the facility during construction and operation;
- Traffic impact on external road network;
- Accessibility and turning requirements;
- National and local haulage routes;
- Assessment of internal roads and site access;
- Assessment of freight requirements and permitting needed for abnormal loads; and
- Traffic accommodation during construction**.**

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:

Project Assessment

- 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.

Access and Internal Roads Assessment

- Assessment of the proposed access points including:
  - Feasible location of access points
  - Motorised and non-motorised access requirements
  - Required minimum stacking distances at access control
  - Sight distances and required access spacing
  - Comments on internal circulation requirements and observations

Haulage Route Assessment

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

Traffic Estimation and Impact

- 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.

Report (Documentation)

- 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:

- Project Information provided by the Client;
- Google Earth.kmz provided by the Client;
- Google Earth Pro Satellite Imagery;
- National Road Traffic Act, 1996 (Act No. 93 of 1996)
- National Road Traffic Regulations, 2000, as amended (NRTA)
- SANS 10280/NRS 041-1:2008 - Overhead Power Lines for Conditions Prevailing in South Africa
- 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
- Manual for Traffic Impact Studies, Department of Transport, 1995;
- TRH26 South African Road Classification and Access Management Manual, COTO; and
- TMH 16 South African Traffic Impact and Site Traffic Assessment Manual (Vol 1/Vol2), COTO, August 2012.

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 5 000 mm, total maximum width 4 300 mm and total maximum length 10 500 mm. 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. The transport of a mobile crane and the transformer are the only abnormal loads envisaged. The crane will be utilised for offloading equipment, such as the transformer.
- Maximum vertical height clearances along the haulage route are 5.2 m 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 in 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 final access points are to be determined during the detailed design stage. Only recommended access points at conceptual level can be given at this stage.
- Planned or approved projects in the vicinity of the site to be considered as part of the cumulative impacts.
- An 18 to 24-months construction period is assumed with some of the construction period dedicated to site prep and civil works.

2.3 Consultation Processes Undertaken

The TIA is based on available project information and consultation with the developer.

3 LEGISLATIVE AND PERMIT REQUIREMENTS

Key legal requirements pertaining to the transport requirements for the proposed project 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 2005 (Act No. 12), as amended, and
- Authorisation from Road Authorities to modify the road reserve to accommodate turning movements of abnormal loads at intersections.

4 DESCRIPTION OF THE PROPOSED DEVELOPMENT

4.1 General Description

The proposed project involves the development of the Rhino and Sunnyside Solar PV facility, comprising a total generation capacity of up to 500MWac (approximately 250MWac each), from renewable solar energy to be supplied to the national Eskom grid as described in Table 1.1. The necessary associated infrastructure, such as the BESS, site camp, substation, overhead powerlines (OHLs), and Operation and Maintenance (O&M) buildings, etc. form a part of this application.

The proposed Rhino and Sunnyside Solar PV project will be located in a rural environment approximately 20 km east and north-east of Beaufort West in the Western Cape Province. The project sites are both located to the south-east of National Route N1 and to the north-east of Regional Route R61. The affected farm is the Remainder of Farm Rhenosterkop 155 for the Rhino PV and Farm 400 for the Sunnyside PV development (see **Figure 4-1** and **Figure 4-2**).

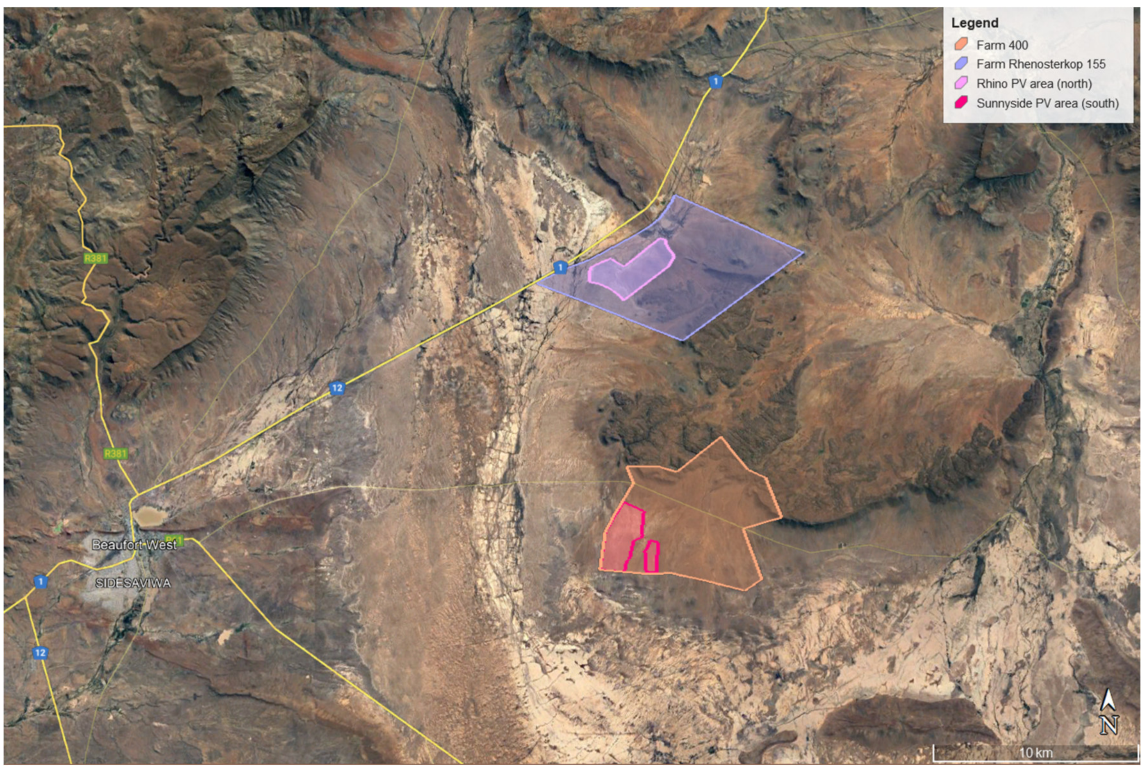

Figure 4-1: Aerial View of the proposed Rhino & Sunnyside PV project including associated infrastructure

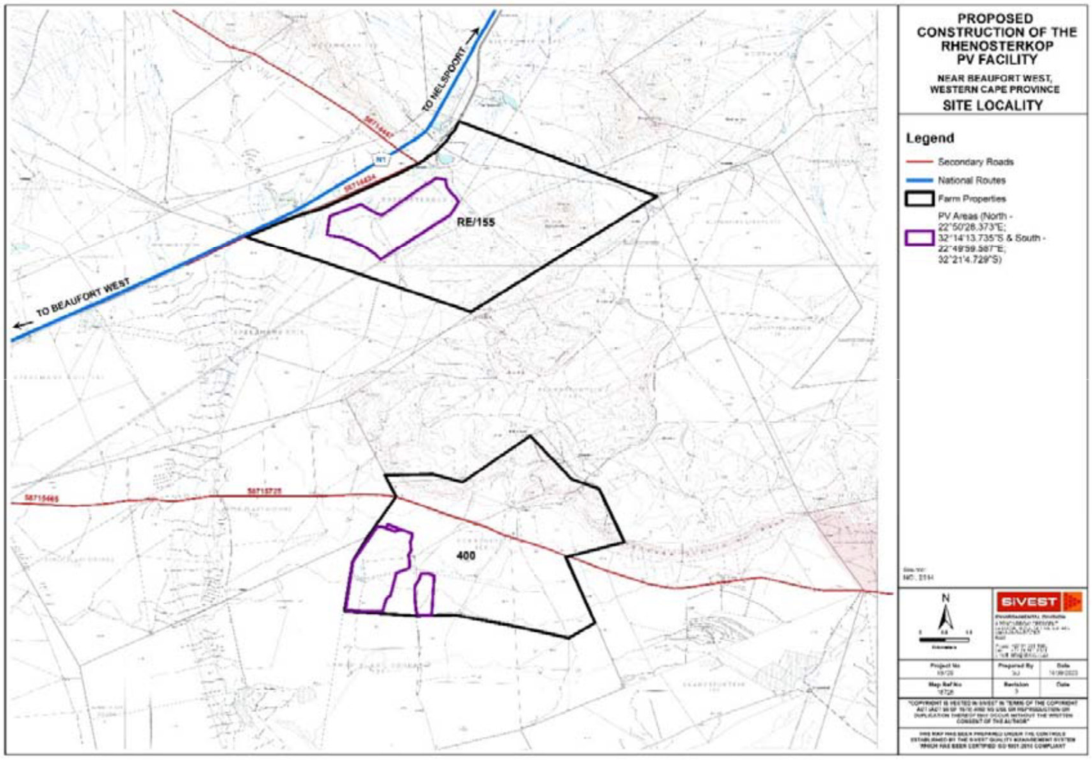

Figure 4-2: Affected farms of the proposed Rhino PV and Sunnyside PV development

The development footprint will contain the following infrastructure to enable the Rhino and Sunnyside Solar PV Facility to generate up to 500 MWac:

- PV panels mounted on either a single axis tracking or fixed structure;
- Inverters and transformers;
- Low voltage cabling between the PV panels and the inverters;
- Electric fencing around the project development area;
- Up to 33kV cabling between the project components and the facility substation (where possible underground);
- One 33kV/132kV on-site facility substation each;
- Site offices and maintenance buildings, including gate house and security building, control centre, offices, conservancy tank and potentially borehole(s);
- Laydown areas and construction camps; and
- Access and internal distribution roads.

4.2 Alternatives

The Department of Environmental Affairs and Tourism (DEAT) 2006 guidelines on 'assessment of alternatives and impacts' proposes the consideration of four types of alternatives, namely, the no-go, location, activity, and design alternatives. It is, however, important to note that the EIA regulations and guidelines specifically state that only 'feasible' and 'reasonable' alternatives should be explored. It also recognizes that the consideration of alternatives is an iterative process of feedback between the developer and Environmental Assessment Practitioner (EAP), which in some instances culminates in a single preferred project proposal. An initial site assessment was conducted by the developer and the farm portion was found favorable due to its proximity to grid connections, solar radiation, site access and relative flat terrain. The greater area was considered based on these factors. However, environmentally sensitive and "no-go" areas, as identified by the specialists, were considered and avoided as far as possible, where required.

The following alternatives were considered in relation to the proposed activity:

Location Alternatives

The proposed solar PV facility forms part of a larger proposed renewable energy (RE) development which includes both solar and wind energy facilities. Currently, there are two SEF clusters proposed, Rhino and Sunnyside. The wind energy facility (WEF) is referred to as "Rhino WEF" of which a small portion extends into Farm Rhenosterkop 155 and Farm 400. The two solar PV facility sites and the WEF are owned by two different companies whose development is being managed by the applicant. An Environmental Site Establishment (ESE) process was undertaken from September 2022 to January 2023 to screen the greater project site from an environmental and social perspective. The ESE process included both desktop studies as well as on-site surveys by avifauna, bat, ecology and heritage specialists. The aim of the ESE was to define the scope of the BA phase of the project.

Originally, for the solar PV facility, the farm Rhenosterkop 155 was identified as most suitable from a topographic, local, and environmental perspective. However, due to an avifauna (Martial Eagle) perspective no-development buffer, the development area was reduced significantly. Furthermore, the landowner did not support solar PV facility development on some sections of the property due to (a) agriculture preference, and (b) the development's potential visual impact as the development would be within direct view of the guest house existing in the farm.

To ensure that the project remains feasible, alternative sites were identified to compensate for the 'lost' capacity. The landowners were consulted, and due to the discussions undertaken, agreed to the solar PV facility development under certain conditions.

Development proposed on Farm 400 needed to be located to the southwest of the property so that it is not visible from the farmstead. A layout was then developed and discussed with the landowner which was agreed upon. Presented with the proposed development area, the landowner noted their support of the development, and that development would be within an area that is not preferred by sheep for grazing that always migrate back to the preferred areas.

For Farm Rhenosterkop 155, the development footprint was reduced as shown. The layouts consider the ESE results, and the landowner's comments and recommendations.

Other alternative locations were identified and assessed from a development perspective. The alternative locations, including surrounding farms, are less desirable to develop due to increased distance from the cluster. From a financial and environmental perspective, the development of other properties would also require additional servitudes that may not be feasible from a cost perspective.

The specialist constraints were considered in developing the proposed design and layout. This exercise also fed into the constraints mapping to identify the most suitable areas for the development of a solar PV facility which is envisaged to result in the least environmental and social impact.

In considering the specialist limitations identified in the screening phase, three no-go areas have been identified and excluded from the proposed development as restricted areas are not suitable for the installation of PV modules. The final available land area covers 498.09 ha.

Considering the above, no further alternatives have been considered for the proposed solar PV facility. RE development in South Africa (SA) is highly desirable from a social, environmental and development point of view and a solar energy installation is more suitable for the site due to the high solar resource.

Reason for the location chosen: These sites are preferred due to the suitable climate, conditions and topography including close proximity to the national grid. Based on the above site-specific attributes, the study area is considered highly preferred in terms of the development of solar and WEFs. As such, no further property/ location alternatives have been considered.

BESS

As technological advances within battery energy storage systems (BESS) are frequent, two BESS technology alternatives are considered: Solid state battery electrolytes and Redox-flow technology. Solid state battery electrolytes, such as lithium-ion (Li-ion), zinc hybrid cathode, sodium ion, flow (e.g., zinc iron or zinc bromine), sodium sulphur (NaS), zinc air and lead acid batteries, can be used for grid applications. Compared to other battery options, Li-ion batteries are highly efficient, have a high energy density and are lightweight. As a result of the declining costs, Li-ion technology now accounts for more than 90% of battery storage additions globally (IRENA, 2019). Flow batteries use solid electrodes and liquid electrolytes. The most used flow battery is the Vanadium Redox Flow Battery (VRFB), which is a type of rechargeable flow battery that employs vanadium ions in different oxidative states to store chemical potential energy.

Design and layout alternatives

Refer to “Location Alternatives” above. Additionally, layout alternatives will be determined upon availability of specialist studies.

Technology alternatives: Solar panels

There are several types of semiconductor technologies currently available and in use for PV solar panels. Two, however, have become the most widely adopted, namely crystalline silicon (Mono-facial and Bi-facial) and thin film. It is not planned to make use of thin film. The technology that (at this stage) proves more feasible and reasonable with respect to the proposed solar facility is crystalline silicon panels, due to it being non-reflective, more efficient, and with a higher durability.

Due to the rapid technological advances being made in the field of solar technology the exact type of technology to be used, such as bifacial panels, will only be confirmed at the onset of the project.

No-go alternative

This alternative considers the option of 'do nothing' and maintaining the status quo. It is understood that the site is currently zoned for agricultural land uses. Should the proposed activity not proceed, the site will remain unchanged and will continue to be used for agricultural purposes. The potential opportunity costs in terms of alternative land use income through rental for energy facility and the supporting social and economic development in the area would be lost if the status quo persist.

4.2.1 Specialist comment regarding alternatives

From a transport engineering perspective, the alternatives listed above (i.e., electrical infrastructure location alternatives and the technology options for the BESS) are equally acceptable as it does have a nominal impact on the traffic on the surrounding road network.

4.3 Proposed Accesses

Several access points for the two facilities were initially assessed in line with access spacing requirements, required sight lines and road safety considerations. However, only the access points and routes discussed hereafter were feasible due to landownership constraints.

4.3.1 Rhino PV

It is proposed to provide access to the Rhino PV site from the N1 onto an existing farm road located to the north of the development site (see **Figure 4-3** and **Figure 4-4**). The recommended access route to the development area will then follow an existing farm road, which may need to be upgraded in some locations to cater for large construction vehicles. The direct site access will then be located on the northern side of the development as indicated in the Figure below.

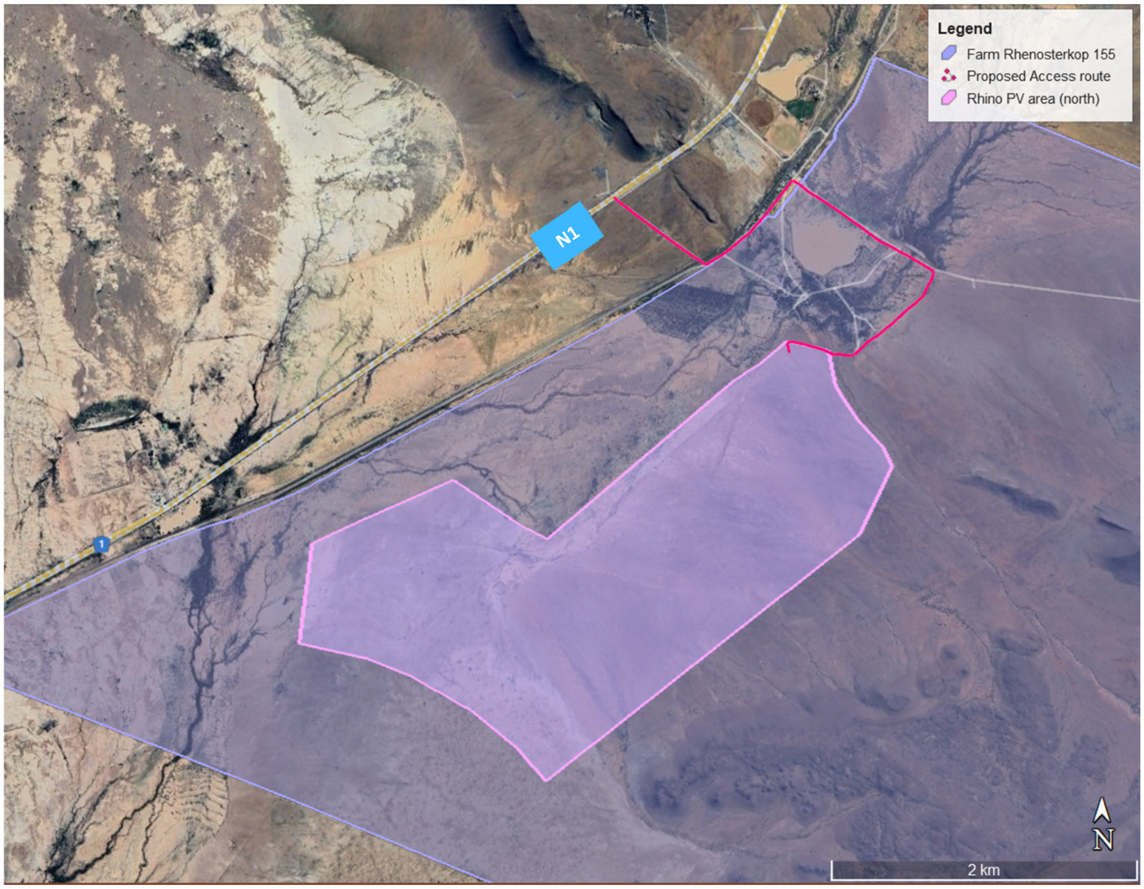

Figure 4-3: Recommended Access route from N1 to Rhino PV development site


Figure 4-4: Farm road from N1 towards Rhino PV site

In accordance with *Figure 2.5.5(a) of the TRH17 Guidelines for the Geometric Design of Rural Roads* (see **Figure 4-5**), the shoulder sight distance for a stop-controlled condition on a road with a speed limit of 120 km/h, needs to be a minimum of 500 m for the largest vehicle (5m set back from the intersecting road). Both, the N1 and the R61 have posted speed limits of 120km/h.

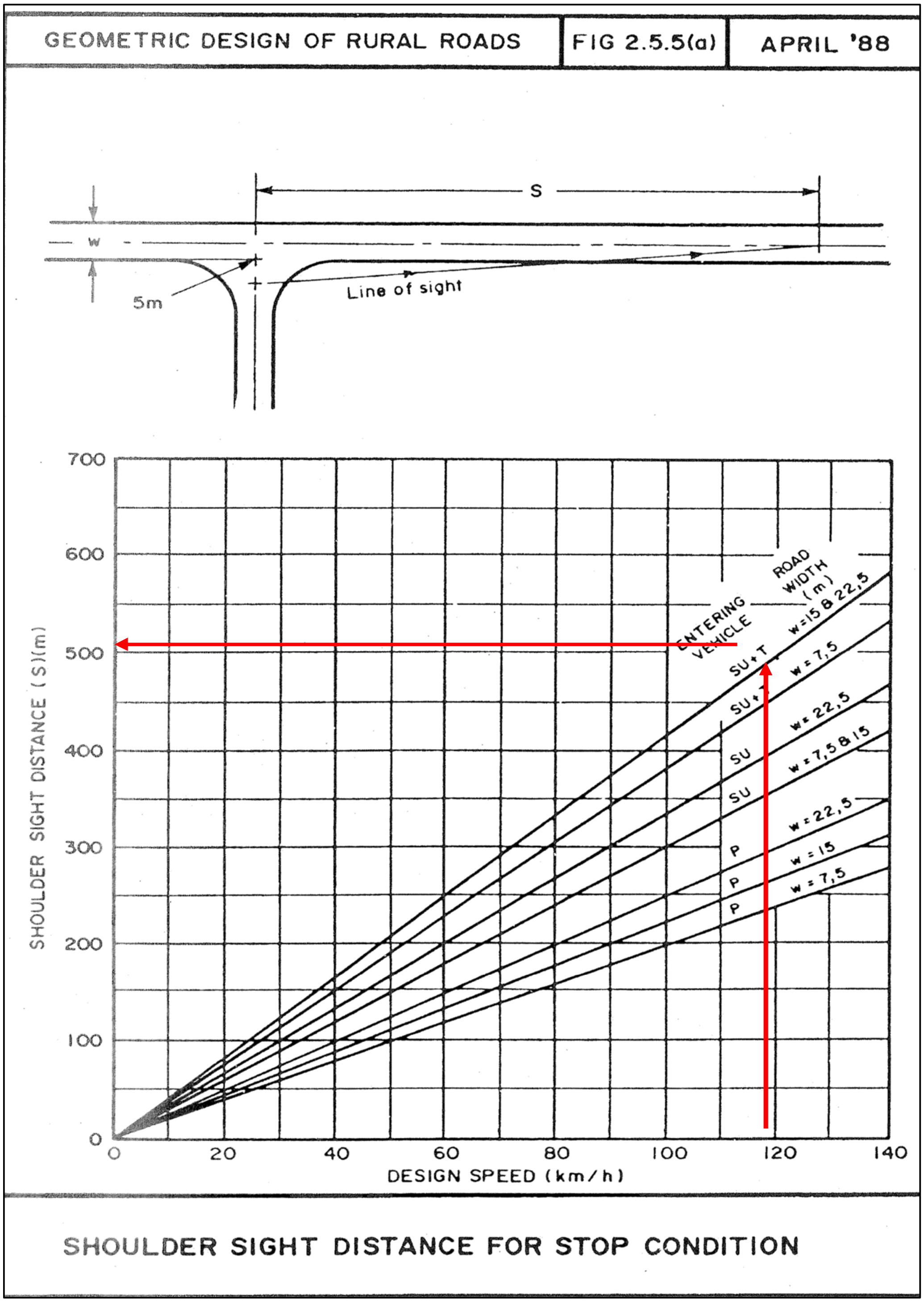

Figure 4-5: Shoulder sight distance (TRH17)

The required minimum shoulder sight distances are met in both directions at the proposed access points (see **Figure 4-6**). However, it needs to be ensured that sight lines are kept clear of any shrubbery or trees and that no obstructing signage or similar is erected.

Figure 4-6 Required Sight distances at access point of N1 with farm road to Rhino PV site

4.3.2 Sunnyside PV

For *Sunnyside PV*, it is proposed that construction vehicles turn from the R61 onto an existing road towards the site approximately 3km outside Beaufort West and follow this road to the site (see **Figure 4-7** and **Figure 4-9**). This access route (shown in orange in the Figure below) may require upgrading to accommodate larger construction vehicles.

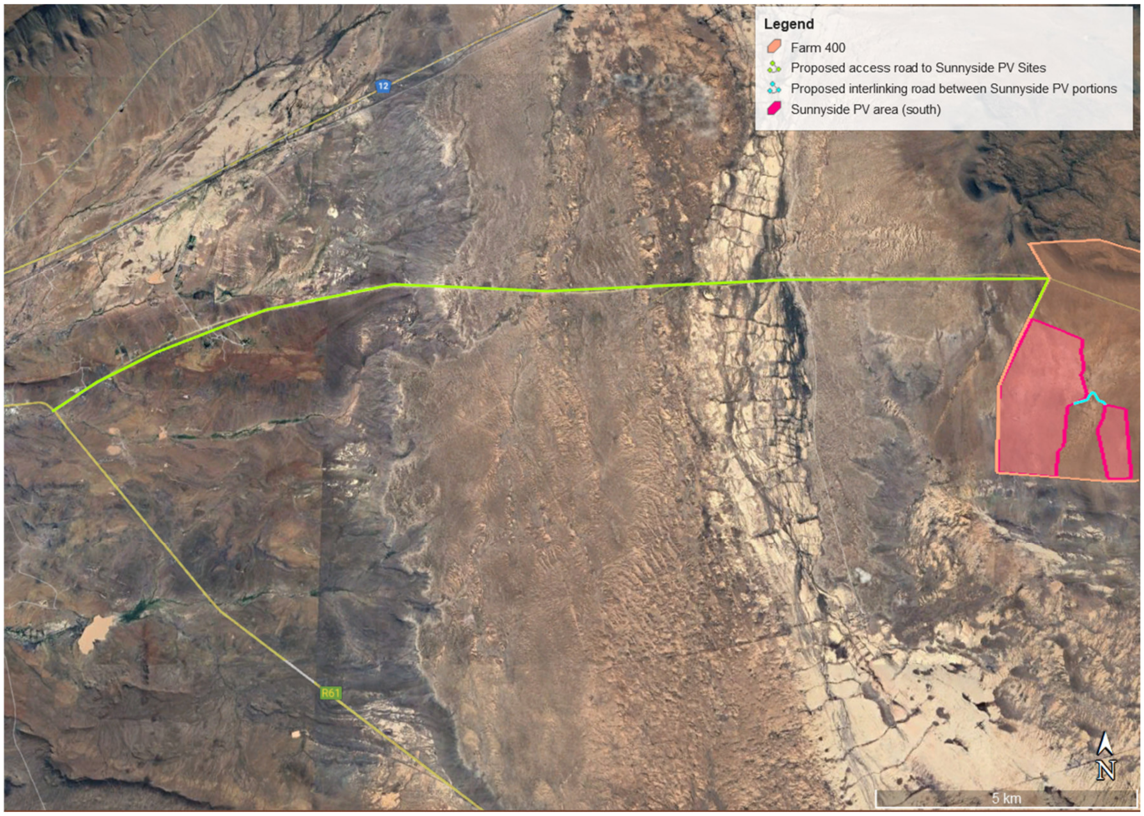

Figure 4-7 Aerial view of recommended access route for Sunnyside PV development

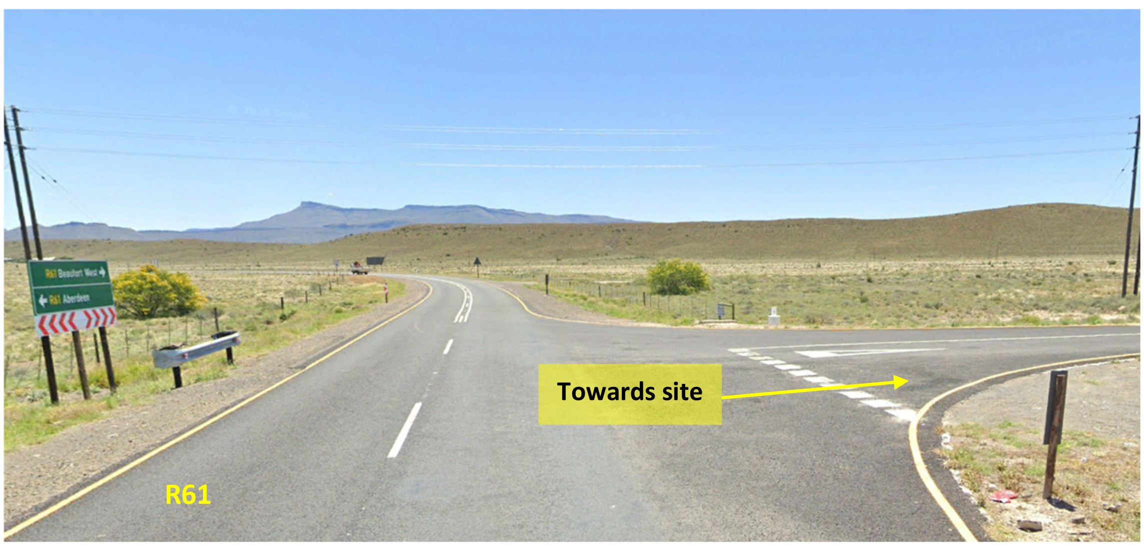

Figure 4-8: Access route to Sunnyside PV sites

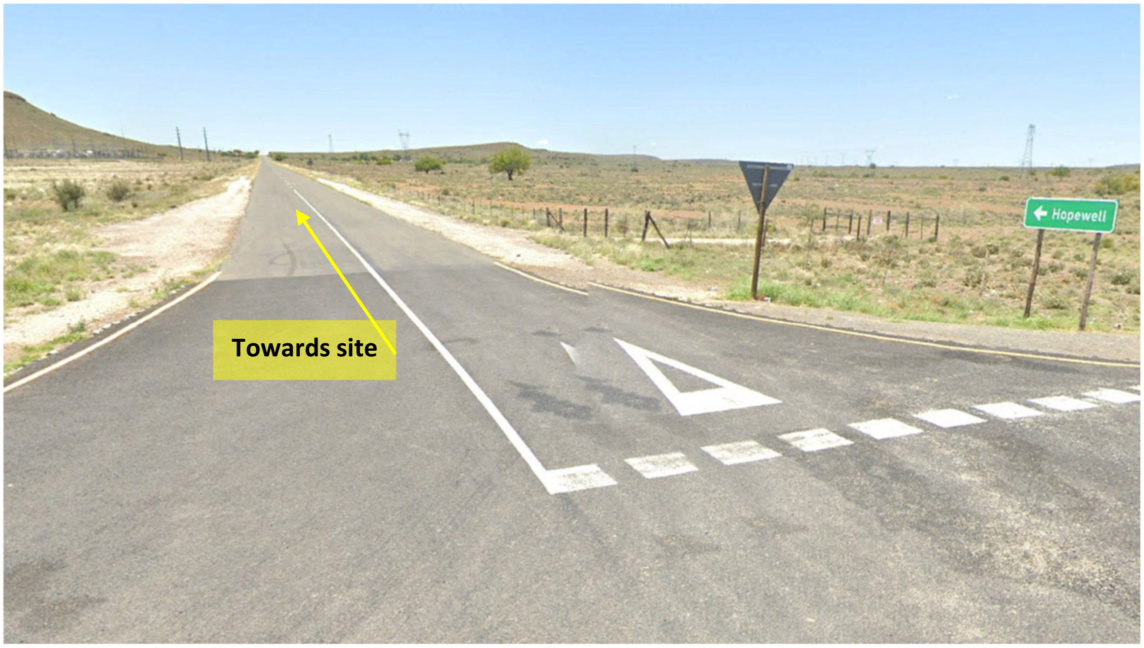

Figure 4-9: Access route to Sunnyside PV sites

The required minimum shoulder sight distances are met in both directions when turning into the R61 from the farm road (see **Figure 4-10)**. However, it needs to be ensured that sight lines are kept clear of any shrubbery or trees and that no obstructing signage or similar is erected.

Especially the sight lines in a western direction for vehicles turning from the farm road into the R61 need to be kept clear as there is a bend situated along the R61. However, due to the area being flat with low vegetation, the sight distances are acceptable. No obstructing signage or larger vegetation should be erected to ensure safe turning movements at this intersection.

Figure 4-10: Required Sight distances at access point on R61 towards Sunnyside PV site

Figure 4-11: View in western direction from farm road intersecting with R61

4.3.3 General

The respective turnoffs from the N1 (for Rhino PV) and R61 (for Sunnyside PV) need to be maintained and any road surface damage caused by construction vehicles needs to be repaired. The same applies to the access route towards the sites. The radii at the access onto the site need to be large enough to allow for all construction vehicles to turn safely.

During the construction phase, temporary road signage in line with the *South African Road Signs Manual (SARTSM*) will need to be erected along the stretch of the N1 and R61 passed the turnoffs towards the respective sites to alert general traffic that construction vehicles turn into and out of R61/N1.

4.4 Internal Roads

The geometric design and layout for the internal roads from the site access need to be established at detailed design stage. Existing structures and services, such as drainage structures, signage and pipelines will need to be evaluated if impacting on the roads. It needs to be ensured that the 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.

4.4.1 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, such as Beaufort West.

4.4.2 Public Transport and Non-Motorised Transport

In terms of the National Land Transport Act 2009 (Act No.5), as amended (NLTA), the assessment of available public transport services is included in this report. The following comments are relevant in respect to the public transport availability for the proposed development.

It is expected that minibus taxis travel along the N1 and R61. However, in many cases, the developer or appointed contractor of a large-scale project, such as many renewable energy projects, either provides shuttle buses or similar or alternatively may accommodate workers on site during the construction phase.

5 DESCRIPTION OF THE TRANSPORT ROUTES TO SITE

5.1 Port of Entry

It is envisaged that imported components will arrive in South Africa at the Port of Ngqura or the Port of Saldanha, being the closest ports to the site. Due to roads limitations, the Port of Cape Town has not been included.

5.1.1 Port of Ngqura

The Port of Ngqura is a world-class deep-water trans-shipment hub offering an integrated, efficient, and competitive port service for containers on transit. The Port forms part of the Coega Industrial Development Zone (CIDZ) and is operated by Transnet National Ports Authority.

The shortest route from the Port of Ngqura to site (approximately 430km to both sites) will take construction and haulage vehicles via the R75 onto the R329 after Kleinpoort, and then the R338, R63 and N1. An alternative route for the Rhino PV site would be staying on the R75 until turning onto the R63 at Graaff Reinet and eventually the N1 (travel distance approximately 475km).

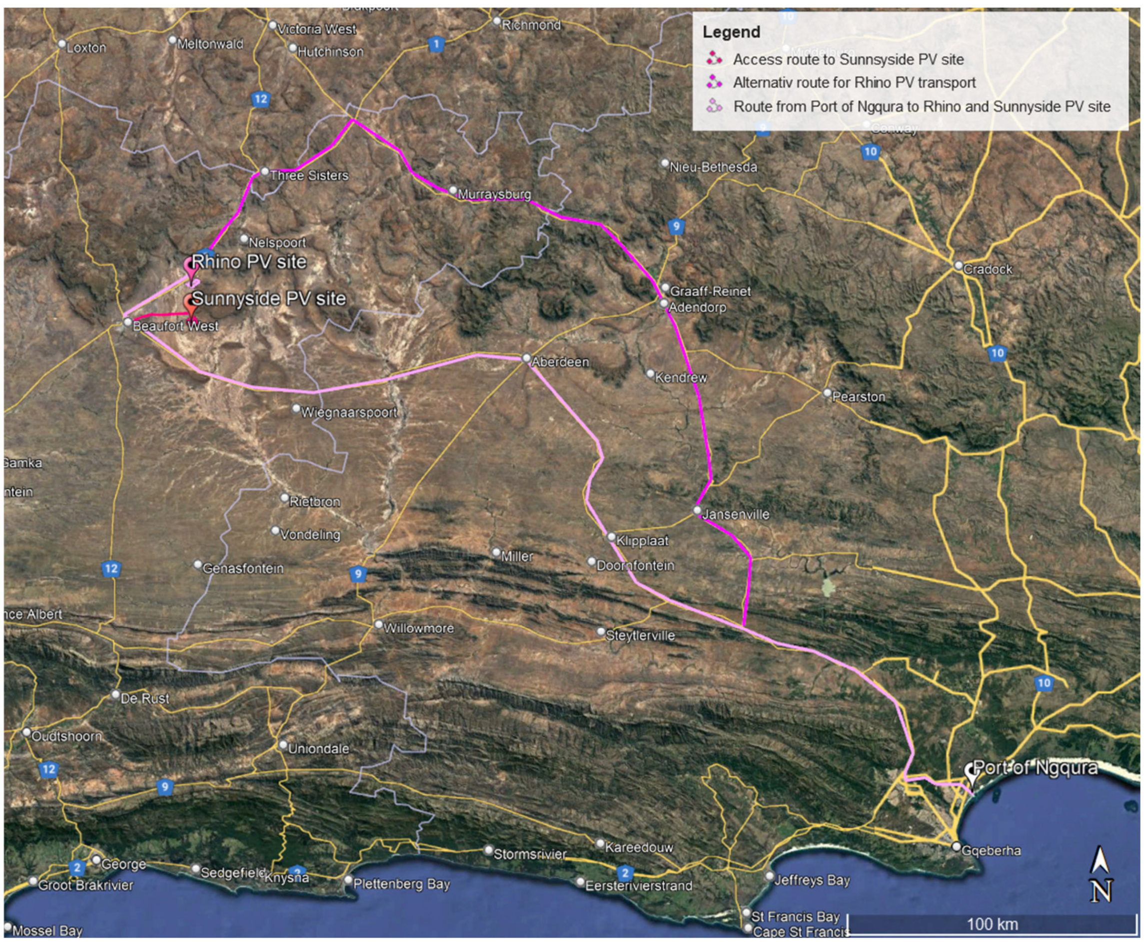

Figure 5-1: Route from Port of Ngqura to project sites

5.1.2 Port of Saldanha

The Port of Saldanha is located in the Western Cape and is the largest and deepest natural port in the Southern Hemisphere able to accommodate vessels with a draft of up to 21.5 m. This port covers a land and sea surface of just over 19,300 ha within a circumference of 91 km with maximum water depths of 23.7 m. Unique to the port is a purpose-built rail link directly connected to a jetty bulk loading facility for the shipment of iron ore. The Port is operated by Transnet National Ports Authority.

One possible route is via the R45, R311, N7 and N1 to site with a travel distance of approximately 550km (see **Figure 5-2**).

Figure 5-2: Aerial view of possible route from Port of Saldanha to site

5.2 Transportation requirements

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

Solar PV:

- Conventional trucks within the freight limitations to transport building material to the site;
- 40-feet container trucks transporting solar modules, frames, and the inverter, which are within freight limitations;
- Flatbed trucks transporting the solar modules and frames, which are within the freight limitations;
- Light Differential Vehicle (LDV) type vehicles 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 transformers will be transported as abnormal loads.

Any grid/power lines:

- 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 the site,
- The transformer transported in an abnormal load,
- Abnormal mobile crane for assembly on site, and
- Transmission tower sections transported by abnormal load.

5.3 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: 22 m for an interlink, 18.5 m for truck and trailer and 13.5 m for a single unit truck
- Width: 2.6 m Height: 4.3m measured from the ground. Possible height of load – 2.7 m.
- Weight: Gross vehicle mass of 56 tons (t) 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, which 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 OHLs (lower than 5.1 m), e.g., Eskom and Telkom lines, along the proposed routes will have to be moved to accommodate the abnormal load vehicles.

5.4 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 National Road Traffic Act and the relevant regulations.

5.5 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 of permits. Embargo lists are compiled annually and are obtainable from the Issuing Authorities.

5.6 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.

5.7 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 and length,
- Front Overhang,
- Rear Overhang,
- Front Load Projection,
- Rear Load Projection,
- Wheelbase,
- Turning Radius, and
- Stability of Loaded Vehicles.

5.7.1 Route for Components manufactured within South Africa

In South Africa, more than half (52%) of the manufacturing industry's national workforce resides in four metros - Johannesburg, Cape Town, Gqeberha 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, Gqeberha 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.

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

Cape Town has a large manufacturing sector located throughout the metro. The proposed industrial hubs being considered to source the required materials and components are currently unknown. With quite an extensive and widespread industrial market, a specific route to the site cannot be considered at this point in time. However, no road limitations are envisaged along the routes (i.e., via N1 or N2) for normal load freight. The estimated travel distance via the N1 is approximately 500 km and is shown in **Figure 5-3**.

Figure 5-3: Route from Cape Town area to project sites

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

If components from the Johannesburg area are considered, normal loads from Johannesburg to the proposed site can be transported via the route as shown in **Figure 5-4** below. No road limitations are envisaged along the route for normal load freight. The travel distance from the Johannesburg area to site is approximately 900 km via the N1.

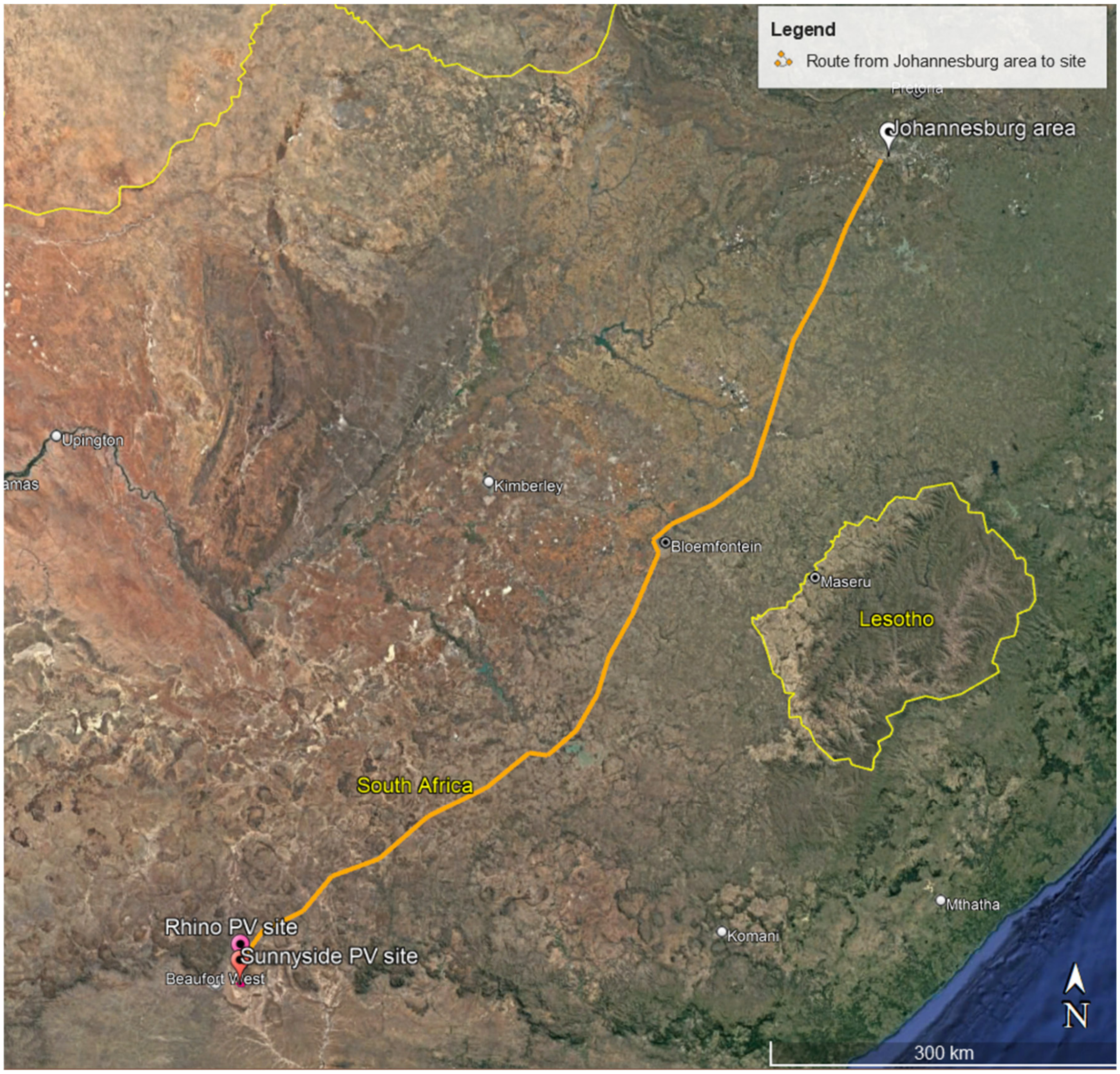

Figure 5-4: Route from Johannesburg area to project sites

5.7.1.3 Route from Pinetown area 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 travel distance from Pinetown to the site via the N3, N5 and N1is approximately 1 150 km (see **Figure 5-5**).

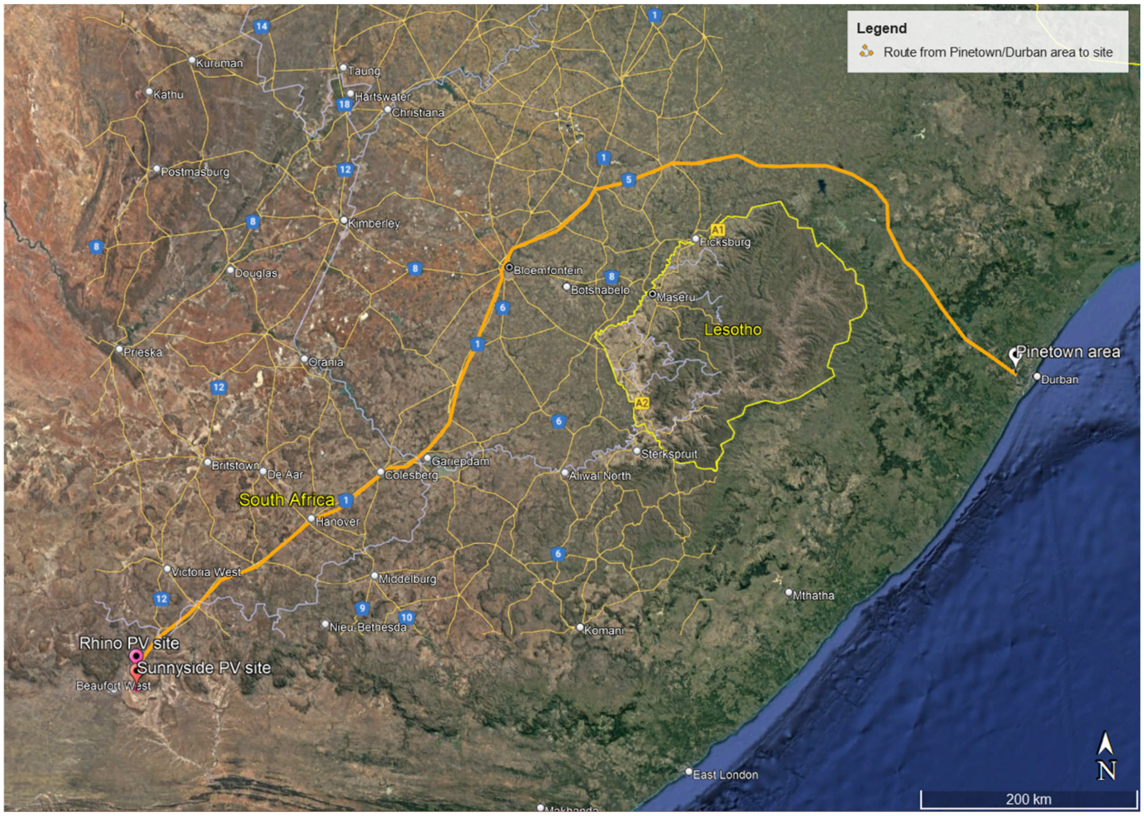

Figure 5-5: Route from Pinetown area to the project sites

5.7.1.4 Route from Gqeberha area to Site - Locally sourced materials and equipment

If loads are transported from the Gqeberha area to site, several routes to site are available. One potential route is shown in **Figure 5-6** via the R75, R338 and R61 with a travel distance of approximately 400km.

Figure 5-6: Route from Gqeberha area to project site

5.7.2 Surrounding road network

The construction vehicles for the proposed Rhino and Sunnyside Solar PV project will take access via the R61 or N1 as described in Section 4.3.

The N1 is a national route that runs from Cape Town though Bloemfontein, Johannesburg, Pretoria and Polokwane to Beit Bridge on the border with Zimbabwe. The R61 is a provincial route that connects Beaufort West with Port Shepstone via Graaff Reinet, Komani, Mthatha and Port Edward (see **Figure 5-7**).

According to the road classification of the surrounding road network as per the *Road Infrastructure Strategic Framework for South Africa (RISFSA)* and *COTO's TRH26 South African Road Classification and Access Management Manual*, the **N1** can be classified as a **Class R1 rural principal arterial** in the vicinity of the project sites, which typically carries countrywide traffic between:

- Metropolitan areas and large cities (population typically greater than about 500 000);
- Large border posts;
- Other Class 1 Arterials; and
- Smaller centres than the above when travel distances are very long (i.e., longer than 500 km).

The **R61** can be classified as **Class 2 rural major arterial**, which typically carries inter-regional traffic between:

- Smaller cities and medium to large towns (population typically greater than about 25 000);
- Smaller border posts;
- Class 1 and other Class 2 routes;
- Important regions, transport nodes and commercial areas that generate large volumes of freight and other traffic such as seaports and international airports.
- Smaller centres than the above when travel distances are relatively long (longer than 200 km).

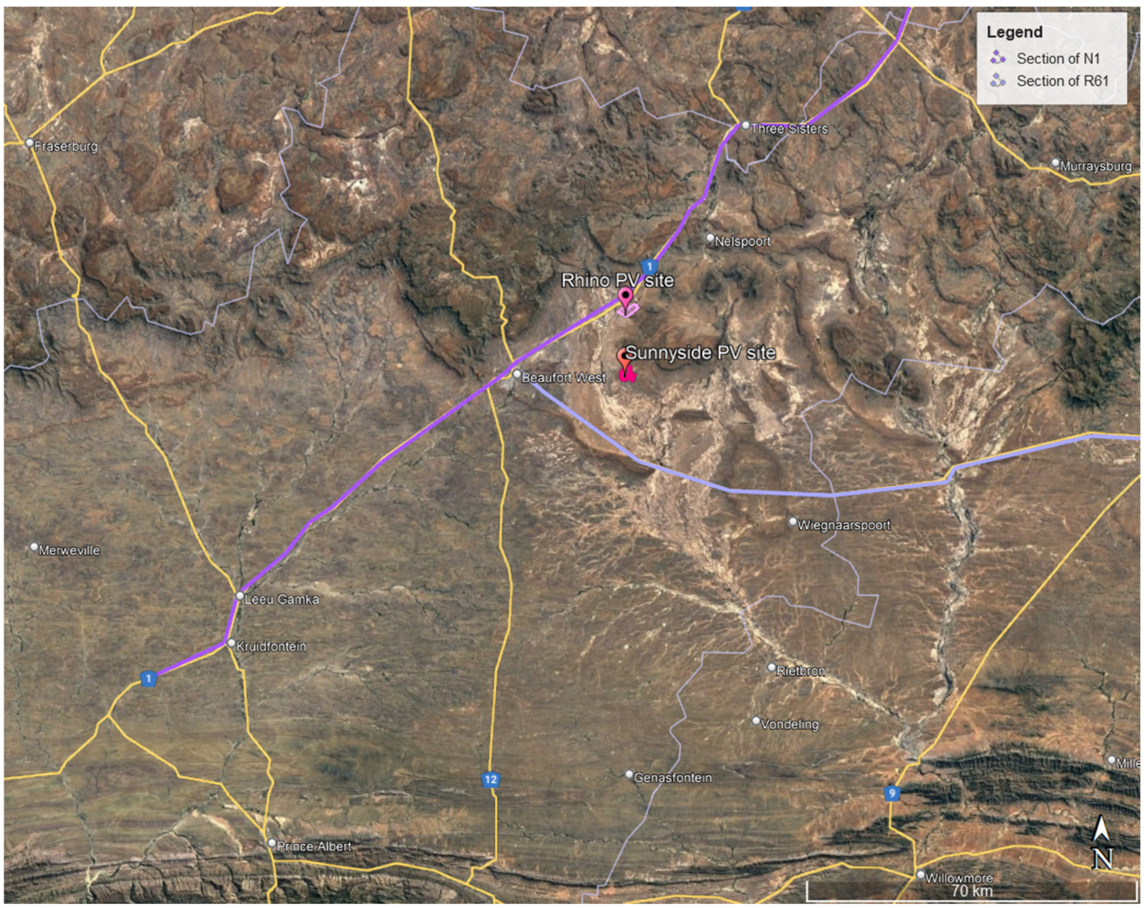

Figure 5-7: Aerial View of Section of N1 and R61

6 ISSUES, RISKS AND IMPACTS

6.1 Identification of Potential Impacts/Risks

The potential impact on the surrounding environment is expected to be generated by the development traffic, of which traffic congestion, associated noise and dust pollution form part of. It must be noted that the significance of the impact is expected to be higher during the construction and decommissioning phases because these phases generate the highest development traffic.

6.2 Construction phase

This phase includes the transportation of people, construction materials and equipment to the site. This phase also includes the construction of the solar power facility and associated infrastructure, including grid connections, construction of footings, roads, excavations, trenching, and ancillary construction works. This phase will temporarily generate the most development traffic.

6.2.1 Nature of impact

The nature of the impact expected to be generated at this phase 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.

6.2.2 Significance of impact without mitigation measures

Traffic generated by the construction of the solar facility will have a notable impact on the surrounding road network. The exact number of trips generated during construction can only be determined later in the project when the contractor and the haulage company are appointed and once more detail is available regarding the staff requirements and where equipment is sourced from. In the interim, an estimate will be made as follows for the purpose of this report.

6.2.3 Estimated peak hour traffic for the solar panel components

At present, solar panels are locally produced in South Africa by only a few select firms. The largest of them is located in Pinetown, Kwa-Zulu Natal. Owing to their limited annual production capacity of approximately 325MW, the bulk of solar modules being deployed on South African PV projects are imported, primarily from East Asia. Where panels are sourced locally, these are typically delivered to site via flatbed trucks.

For the purpose of the Transport study and calculation of trips, it is assumed that all panels will be imported. Considering a loading capacity of around 600 solar panels per 40tf container, the total number of trips will result in approximately 1 667 trips for the two 250 MW developments (i.e., 500 MW total). Spacing the transport of the panels over a 2-months period (i.e., 22x2 workdays), **the daily number of trips would result in approximately 38**. Looking at around 30% of these trips occurring during the peak traffic periods, the number of trips for the delivery of the panels during peak traffic will be around 11 trips, which can be accommodated by the external road network.

6.2.4 Estimated staff trips

For the purpose of this study, it was assumed that all workers need to travel to site on a daily basis in transport made available by the appointed contractor. The combined work force is estimated to be around 600 workers for Rhino and Sunnyside Solar PV facility (300 workers per site) during construction. This includes skilled, semi-skilled and unskilled workers. Approximately 60-70% could be locals. The **resulting daily staff trips are then 55** (shown in **Table 6-1**).

Table 6-1: Estimation of daily staff trips

Vehicle Type	Number of vehicles	Max. Number of Employees
Car	15	15 (assuming 1 occupant)
Bakkie	20	60 (assuming 3 occupants)
Taxi – 15 seats	15	225
Bus – 60 seats	5	300
Total	***55***	***600***

6.2.5 Estimated material trips

The exact number of vehicle trips for the transportation of materials during the construction phase depends on the type of vehicles, planning of the construction, source/location of construction material, etc. However, for the purpose of this study, it was estimated that at the peak of construction, a total of **approximately 300 construction vehicle trips** will arrive at the sites per day.

The total estimated daily site trips, at the peak of construction, are shown in **Table 6-2** below.

Table 6-2: Estimation of daily site trips

Activity	Number of daily trips
Solar panel component delivery	38
Staff transport	55
Material delivery	300
Total	**393**

With the recommended mitigations in this report, the impact on the surrounding road network and the general traffic is deemed acceptable, as the 393 trips (~44 trips per hour for both sites) will be distributed over a 9-hour workday. It is expected that the majority of the trips will occur outside the peak hours.

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.

The development traffic impact during the construction phase can be assessed as manageable, considering that the construction phase is temporary in nature and mitigation measures, mentioned in this report, are adhered to and keep the impact level low.

6.3 Operational Phase

This phase includes the operation and maintenance of the Rhino PV and Sunnyside PV projects throughout their life span.

6.3.1 Nature of impact

The nature of the impact expected to be generated at this phase would be traffic and the associated noise, dust and exhaust pollution due to the operational traffic trips.

6.3.2 Estimated peak hour traffic generated during operation

The exact number of permanent staff expected for the operational phase is still unknown. Based on similar studies, it can be estimated that approximately 25-30 full-time employees will be stationed per site (with ~4-5 skilled and ~16-25 un/semi-skilled workers, depending on contracts). Assuming a worst-case scenario of 30% of the trips occurring during peak traffic periods, a maximum of 9 peak hour trips per site and consequently 18 peak hours trips for both developments are estimated for the operational phase, which will have a nominal impact on the external road network.

It is assumed that the solar modules would need to be cleaned twice a year. No further information on which cleaning method and technology will be used is available at this point in time and if borehole water can be used. The following assumptions have been made to estimate the resulting trips generated from transporting water to the site:

- 10 000-liter water bowsers be used for transporting the water (larger water bowsers are available in South Africa but for the purpose of this study, a smaller bowser was chosen for a conservative approach);
- Approximately 5 litres of water needed per panel;
- Assuming that a total of 1 000 000 panels for both sites are used, this would amount to approximately 500 vehicle trips; and
- Solar modules will be cleaned twice a year.

To limit any traffic impact on the surrounding road network, it is recommended to

- Clean the panels for the two sites at different times during the year,
- Schedule these trips outside of peak traffic periods and
- Clean the solar modules over the course of a few days i.e., spread the trips over a 5-day work week.

For one project of 250MW (i.e., 500 000 panels), 250 trips would be generated, resulting in 50 daily trips (delivery of water spread over a 5-day period) with the trips anticipated during peak to be around 15 (30% of 50).

Additionally, the provision of rainwater tanks on site or borehole water would decrease the number of trips.

6.3.3 Proposed general mitigation measures

The following are general mitigation measures to reduce the impact that the additional traffic will have on the road network and the environment:

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

- Dust suppression of gravel roads located within the site boundary, including the main access road to the site and the site access roads, during the construction phase, if required.
- Regular maintenance of gravel roads located within the site boundary, including the access roads to the sites, by the Contractor during the construction phase and by the Owner/Facility Manager during the operational phase, as/if required.
- Monitoring and addressing any damage caused by construction vehicles to the turnoffs towards the sites on the N1 and R61, respectively.
- The use of mobile batch plants and quarries near the site would decrease the traffic impact on the surrounding road network, if available and feasible.
- Staff and general trips should occur outside of peak traffic periods as far as possible.
- Vehicular movements within the site boundary are the responsibility of the respective Contractor and the Contractor must ensure that all construction road traffic signs and road markings (where applicable) are in place.
- If required, low hanging OHLs (lower than 5.1m) e.g., Eskom and Telkom lines, along the proposed routes will have to be moved (to be arranged by the haulage company and communicated beforehand with the service provider of the OHL) to accommodate the abnormal load vehicles. The Contractor and the Developer are to ensure that the haulage company is aware of this requirement.
- The haulage company is to provide evidence to the Contractor and the Developer that any affected OHLs have been moved or raised.
- The preferred route should be surveyed by the developer 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). 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 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. The "dry-run" should be undertaken within the same month that components are expected to arrive. The haulage company is to provide evidence that the route has been surveyed and deemed acceptable for the transportation of the abnormal load.
- The Contractor needs to ensure that the gravel sections of the haulage routes (i.e., the site access road and the main access road to the site) remain in good condition and will need to be maintained during the additional loading of the construction phase and reinstated after construction is completed.
- Design and maintenance of internal roads. The internal gravel roads will require grading with a grader to obtain a camber of between 3% and 4% (to facilitate drainage) and regular maintenance blading will also be required. 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.

6.3.4 Significance of impact with mitigation measures

It should be noted that the construction phase is temporary and short term in nature and the associated impacts can be mitigated to an acceptable level.

The proposed mitigation measures for the construction traffic will result in a reduction of the impact on the surrounding road network and the impact on the local traffic will be low as the existing traffic volumes are deemed to be low. Dust suppression will result in significantly reducing the impact.

6.3.5 Decommissioning phase

This phase will have similar, if not less, impacts and generated trips as the Construction Phase.

6.3.6 Cumulative Impacts

To assess a cumulative impact, it is generally assumed that all currently approved and authorized projects within a 35 km radius would be constructed at the same time. This is a precautionary approach as in reality, these projects would be subject to a highly competitive bidding process and not all the projects may be selected to enter into a Power Purchase Agreement. Even if the facilities are constructed and/or decommissioned at 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. The construction and decommissioning phases of a renewable energy project are the only significant traffic generators. The duration of these phases is short term, i.e., the potential impact of the traffic generated during the construction and decommissioning phases on the surrounding road network is temporary and solar projects, when operational, do not add any significant traffic to the road network. At the time of preparing this report, the projects listed shown in **Figure 6-1** and listed in **Table 6-3** were considered in the impact assessment discussed in Chapter 7.

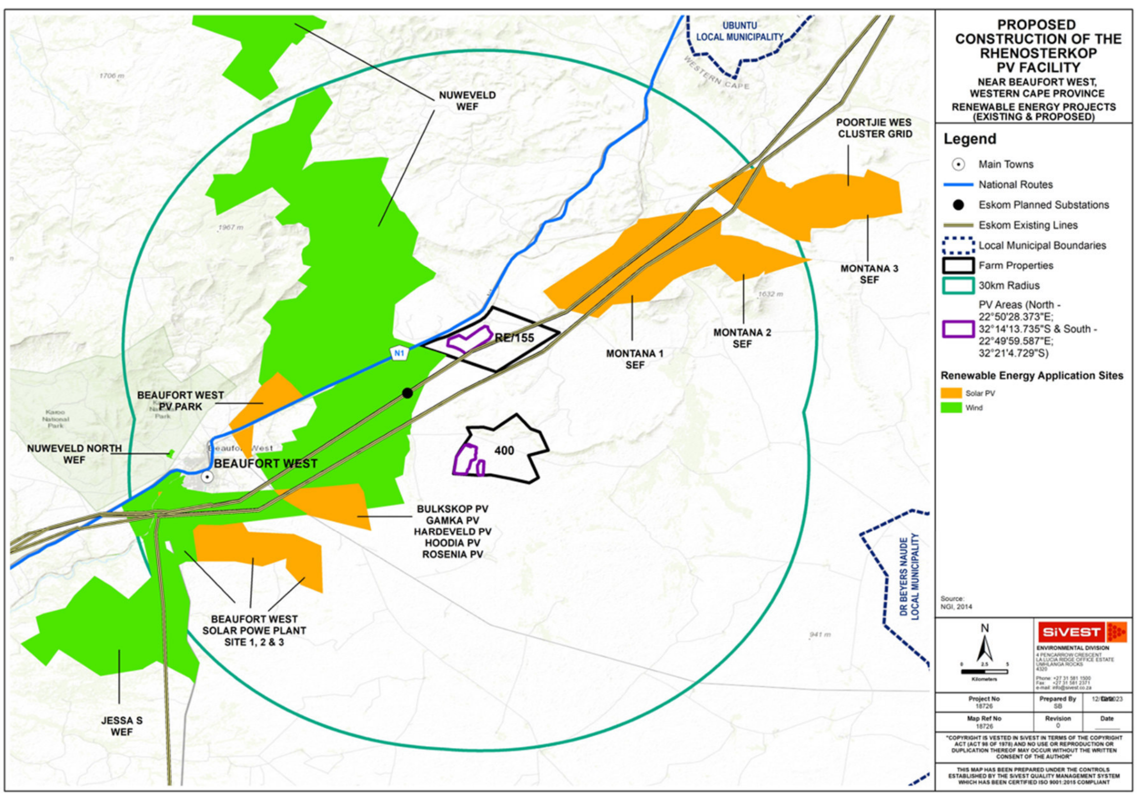

Figure 6-1: Approved RE project within 35km radius of the Rhino PV and Sunnyside PV projects

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Table 6-3: Approved RE project within 35km radius of the Rhino PV and Sunnyside PV projects

DEA_REF	EIA_PROCES	PROJ_TITLE	DISTRICT_MUN	PROVINCE	TECHNOLOGY	CAPACITY (MW)	LOCAL_MUN	PRJ_STATUS
14/12/16/3/3/1/2517	BAR	The construction of a 120 MW PV solar energy facility (Known as the Bulkskop PV) located on the remaining extent (portion 0) OF FARM 423 approximately 12 KM South-EAST of Beaufort West in the Beaufort West Local Municipality, Western Cape Province	Central Karoo District Municipality	Western Cape	PV	120	Beaufort West Local Municipality	Approved
14/12/16/3/3/1/2518	BAR	The construction of a 120 MW PV solar energy facility (Known as the Gamka PV) located on the remaining extent (portion 0) of farm 423 approximately 12KM South-East of Beaufort west in the Beaufort West Local Municipality, Western Cape Province	Central Karoo District Municipality	Western Cape	PV	120	Beaufort West Local Municipality	Approved
14/12/16/3/3/1/2519	BAR	The construction of 120 MW photovoltaic (PV) solar energy facility (known as the Hardeveld PV) located on the remaining extent (portion 0) of farm 423, Western Cape Province	Central Karoo District Municipality	Western Cape	PV	120	Beaufort West Local Municipality	Approved
14/12/16/3/3/1/2520	BAR	The construction of a 120MW PV solar energy facility (Known as Hoodia PV) in the Beaufort West Local Municipality, Western Cape Province	Central Karoo District Municipality	Western Cape	PV	120	Beaufort West Local Municipality	Approved
14/12/16/3/3/1/2521	BAR	The construction of a 120 MW photovoltaic (PV) solar energy facility (known as the Rosenia PV), Western Cape Province	Central Karoo District Municipality	Western Cape	PV	120	Beaufort West Local Municipality	Approved
12/12/20/2133	BAR	Proposed Construction of19MW Photovoltaic Solar Facility Proposed By Lurama 214 Pty Ltd On Portion 1 Of The Farm Steenrotsfontein 168, Beaufort West, Western Cape Province	Central Karoo District Municipality	Western Cape	PV	19	Beaufort West Local Municipality	Approved
12/12/20/2133/A1	Amendment	Proposed Construction of19MW Photovoltaic Solar Facility Proposed By Lurama 214 Pty Ltd On Portion 1 Of The Farm Steenrotsfontein 168, Beaufort West, Western Cape Province	Central Karoo District Municipality	Western Cape	PV	0	Beaufort West Local Municipality	Approved
12/12/20/2133/AM3	Amendment	Proposed Construction of19MW Photovoltaic Solar Facility Proposed By Lurama 214 Pty Ltd On Portion 1 Of The Farm Steenrotsfontein 168, Beaufort West, Western Cape Province	Central Karoo District Municipality	Western Cape	PV	0	Beaufort West Local Municipality	Approved
12/12/20/2133/AM4	Amendment	Proposed Construction of19MW Photovoltaic Solar Facility Proposed By Lurama 214 (Pty) Ltd On Portion 1 Of The Farm Steenrotsfontein 168, Beaufort West, Western Cape Province	Central Karoo District Municipality	Western Cape	PV	0	Beaufort West Local Municipality	Approved
12/12/20/2133/AM5	Amendment	Proposed Construction of19MW Photovoltaic Solar Facility Proposed By Lurama 214 (Pty) Ltd On Portion 1 Of The Farm Steenrotsfontein 168, Beaufort West, Western Cape Province	Central Karoo District Municipality	Western Cape	PV	0	Beaufort West Local Municipality	Approved
12/12/20/2286	Scoping and EIA	The Proposed Beaufort West Photovoltaic Park On Portion9 Of The Farm 161 Kuilspoort in The Western Cape Province	Central Karoo District Municipality	Western Cape	PV	85	Beaufort West Local Municipality	Approved
12/12/20/2286/AM4	Amendment	The Proposed Beaufort West Photovoltaic Park On Portion9 Of The Farm 161 Kuilspoort in The Western Cape Province	Central Karoo District Municipality	Western Cape	PV	0	Beaufort West Local Municipality	Approved
14/12/16/3/3/1/2332	BAR	Proposed 75MW Beaufort West Photovoltaic (PV) Project, Western Cape Province	Central Karoo District Municipality	Western Cape	PV	75	Beaufort West Local Municipality	Approved
14/12/16/3/3/2/772	Scoping and EIA	Proposed establishment of the Beaufort West Solar Power Plant Site 1, Western Cape Province	Central Karoo District Municipality	Western Cape	PV	90	Beaufort West Local Municipality	Approved
14/12/16/3/3/2/773	Scoping and EIA	Proposed Establishment of the Beaufort West Solar Power Plant Site 2, Western Cape Province	Central Karoo District Municipality	Western Cape	PV	90	Beaufort West Local Municipality	Approved
14/12/16/3/3/2/774	Scoping and EIA	Proposed Beaufort West Solar power plant site 3 near Beaufort West, Western Cape Province	Central Karoo District Municipality	Western Cape	PV	90	Beaufort West Local Municipality	Approved

DEA_REF	EIA_PROCES	PROJ_TITLE	DISTRICT_MUN	PROVINCE	TECHNOLOGY	CAPACITY (MW)	LOCAL_MUN	PRJ_STATUS
14/12/16/3/3/1/2494	BAR	The proposed 220MW Jessa m wind energy facility (WEF) and associated infrastructure near Beaufort west in the Western Cape Province	Central Karoo District Municipality	Western Cape	Wind	220	Beaufort West Local Municipality	Approved
14/12/16/3/3/1/2496	BAR	The proposed 220MW jessa z wind energy facility (WEF) and associated infrastructure, near Beaufort West in the Western Cape Province	Central Karoo District Municipality	Western Cape	Wind	220	Beaufort West Local Municipality	Approved
16/3/3/1/C3/2/0032/22	BAR	PROPOSED DEVELOPMENT OF A RADIO MAST, APPROXIMATELY 90 METRES IN HEIGHT ON PORTION 1 OF THE FARM NO. 15 OF TRAKASKUILEN LOCATED ON THE BEAUFORT WEST CLUSTER OF WIND FARM DEVELOPMENTS, NEAR THE TOWN OF BEAUFORT WEST IN THE WESTERN CAPE PROVINCE	Central Karoo District Municipality	Western Cape			Beaufort West Local Municipality	Approved
WC 30/5/1/3/2/10319MP	EIA	MINING PERMIT AND RELATED INFRASTRUCTURE FOR MINING OF DOLERITE ON A PORTION OF THE REMAINING PORTION OF THE FARM RHENOSTERKOP NO.155,	Central Karoo District Municipality	Western Cape	Mining		Beaufort West Local Municipality	Approved

7 IMPACT ASSESSMENT

7.1 Potential Impact during the Construction Phase

The construction phase will generate traffic including transportation of people, construction materials, water, and equipment (abnormal trucks transporting the transformers). The exact number of trips generated will be determined at a later stage. Based on the high-level screening of impacts, a negative low impact rating can be expected during the construction phase with mitigation measures (see **Table 7-2**).

Nature of the impact

- Temporary increase in traffic, noise and dust pollution associated with potential traffic.
- Possible road surface damage caused by construction vehicles.

The impact methodology as provided by SiVEST SA (Pty) Ltd was utilised (see **Annexure C**).

7.2 Potential Impact (Operational Phase)

Nature of the impact

- Noise and dust pollution associated with potential traffic.

The traffic generated during this phase will have a nominal impact on the surrounding road network. The impact evaluation is shown in **Table 7-2** . The following items need to be clarified:

- The number of permanent employees
- Water source to be clarified – borehole or transported to site
- Size of water tankers if water is to be delivered on site

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 and associated noise and pollution are expected (see **Table 7-2**).

7.4 Cumulative Impacts during the Construction Phase

For the cumulative impact during the construction phase, the project listed in Section 6.3.6 were considered.

7.5 Impact Assessment Summary

The overall impact significance findings, following the implementation of the proposed mitigation measures, are shown in **Table 7-1**.

Table 7-1: Summary of overall Impact Significance

Rhino & Sunnyside Solar PV	Impact Rating pre-mitigation	Impact Rating post-mitigation
Construction/ Decommissioning	Negative Medium	Negative Low
Operational	Negative Low	Negative Low
Cumulative	Negative High	Negative Medium

Table 7-2: Impact Rating Table

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		Extent [E]	Probability [P]	Reversibility [R]	Irreplaceable loss of resources [I]	Duration [D]	Intensity / Magnitude [I / M]	TOTAL	STATUS (+ OR -)	Significance Rating [S]		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	
Construction Phase / Decommissioning Phase																				
Development traffic impact / related noise & dust pollution	Temporary increase in traffic due to construction vehicle trips on the external road network / increase in noise and dust pollution levels during construction period / possible damage to rpad surface of access routes	4	3	1	2	2	2	24	-	Medium	Stagger component delivery to site; Reduce the construction period if possible; Stagger construction phase tasks; make use of any quarries in the vicinity of the site to decrease the impact of development trips on the external roads; staff and general trips should occur outside of peak traffic periods as much as possible; monitor access routes for possible damage to mitigat early on, regular spraying of internal site roads with water.	4	2	1	2	2	1	11	-	Low
Operational Phase																				
Traffic Impact due to maintenance and permanent site staff trips / periodical trips to site for transport of water.	Slight increase of vehicle trips due to permanent staff traveling to site, periodically (bi-annual) trips to site for transport of water and irregular maintenance trips	2	3	1	1	3	1	10	-	Low	Source on-site water supply as far as possible; Utilise cleaning systems for panels needing less vehicles trips; Schedule trips for the provision of water for the cleaning of panels outside peak traffic periods as much as possible.	2	2	1	1	3	1	9	-	Low
Cumulative																				
Cumulative traffic impacts due to other approved RE projects in a 35km radius around the project sites	Further traffic impact due to increased traffic by other RE project being developed during the same time	3	3	1	2	2	4	44	-	High	Same mitigation measures as above for construction phase. It is noted that it is unlikely that the approved developments will be constructed at the exact same time. However, for the event that the developments have similar constructions periods and use similar routes to site, it is recommended to agree on scheduling trips between projects with similar construction phase as much as possible.	3	3	1	1	2	3	30	-	Medium

8 NO-GO ALTERNATIVE

The no-go alternative implies that the proposed Rhino and Sunnyside Solar PV project as well as their associated infrastructure do not proceed. This would mean that there will be no negative environmental impacts and no traffic impact on the surrounding network during the construction and decommissioning phases due to this project. 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 its targets for renewable energy. Hence, the no-go alternative is not a preferred alternative.

9 INPUT INTO THE ENVIRONMENTAL MANAGEMENT PROGRAMME

The following information needs to be included into the Environmental Management Programme (EMPr) – see Table 9-1 and **Table 9-2**.

Table 9-1: Mitigation Measures

Project aspect	Traffic & Transport related items
Potential Impact	▪ Increase in trips on external roads ▪ Noise and dust pollution ▪ Possible damage to road surfaces caused by construction vehicles
Activity/Risk source:	Increase in traffic on external roads impacting on delivery schedules and general traffic movements.
Mitigation measures:	▪ The delivery of components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods. ▪ Dust suppression of gravel roads located within the site boundary, including the main access road to the site and the site access roads, during the construction phase, if required. ▪ Regular maintenance of gravel roads located within the site boundary, including the access roads to the site. ▪ Monitoring and addressing any damage to the section of access routes close to the sites caused by construction vehicles. ▪ The use of mobile batch plants and quarries near the site would decrease the traffic impact on the surrounding road network, if available and feasible. ▪ Staff and general trips should occur outside of peak traffic periods as far as possible. ▪ The preferred route should be surveyed by the developer to identify problem. ▪ Design and maintenance of internal roads. ▪ For upgraded or newly constructed site and access roads, it needs to be ensured that all bellmouths and radii of bends can accommodate the largest construction vehicle.

Table 9-2: Responsibility

Mitigation: Action/control	Responsibility	Timeframe
Impact on external traffic	Contractor and developer	During construction phase
Noise/dust pollution	Contractor	During construction phase
Possible damage to roads in the vicinity of the site	Contractor	During and after construction

10 CONCLUSION AND RECOMMENDATIONS

The potential traffic and transport related impacts for the construction, operation and decommissioning phases of the proposed Rhino PV and Sunnyside PV projects were identified and assessed and are summarized as follows:

- The traffic impact of the solar PV facility was assessed together as requested by the developer.
- The main impact on the external road network will be during the construction phase. This phase is temporary in comparison to the operational period. The number of abnormal loads vehicles was estimated and found to be able to be accommodated by the road network including the recommended mitigation measures.
- The traffic generated during the construction phase, although significant, will be temporary and impacts are considered to be of medium negative impact. However, *with mitigation measures* a rating of **negative low** impact can be given.
- During operation, it is expected that maintenance and security staff will periodically visit the facility and water be transported to site possibly twice a year for the cleaning of panels. The generated trips can be accommodated by the external road network and the impacts are rated **negative low** *with the recommended mitigation measures*.
- The traffic generated during the decommissioning phase will be similar to or even less than the construction phase traffic and the impact on the surrounding road network will also be considered to be of **low negative** impact *with mitigation measures*.
- For the cumulative impact, all approved developments in a radius of 35 km from the project site were considered to be developed at the same time (which will in reality be unlikely). *After mitigation*, a rating of a **negative medium** impact is given.
- No fatal flaws were picked up during the assessment provided that the mitigation measures are considered as far as possible.

The mitigation measures recommended for the construction and decommissioning phases, and to be included in the Environmental Management Programme (EMPr) for the project are:

- The delivery of components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.
- Dust suppression of gravel roads located within the site boundary, including the main access road to the site and the site access roads, during the construction phase, if required.
- Regular maintenance of gravel roads located within the site boundary, including the access roads to the site, by the Contractor during the construction phase and by the Owner/Facility Manager during the operational phase, if required.
- Monitoring and addressing any damage to the section of the R75 close to the sites caused by construction vehicles.

- The use of mobile batch plants and quarries near the site would decrease the traffic impact on the surrounding road network, if available and feasible.
- Staff and general trips should occur outside of peak traffic periods as far as possible.
- Vehicular movements within the site boundary are the responsibility of the respective Contractor and the Contractor must ensure that all construction road traffic signs and road markings (where applicable) are in place.
- If required, low hanging OHLs (lower than 5.1m) e.g., Eskom and Telkom lines, along the proposed routes will have to be moved (to be arranged by the haulage company and communicated beforehand with the service provider of the OHL) to accommodate the abnormal load vehicles. The Contractor and the Developer are to ensure that the haulage company is aware of this requirement.
- The haulage company is to provide evidence to the Contractor and the Developer that any affected OHLs have been moved or raised.
- The preferred route should be surveyed by the developer 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). 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 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. The "dry-run" should be undertaken within the same month that components are expected to arrive. The haulage company is to provide evidence that the route has been surveyed and deemed acceptable for the transportation of the abnormal load.
- The Contractor needs to ensure that the gravel sections of the haulage routes (i.e., the site access road and the main access road to the site) remain in good condition and will need to be maintained during the additional loading of the construction phase and reinstated after construction is completed.
- Design and maintenance of internal roads. The internal gravel roads will require grading with a grader to obtain a camber of between 3% and 4% (to facilitate drainage) and regular maintenance blading will also be required. 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.
- For upgraded or newly constructed site and access roads, it needs to be ensured that all bellmouths and radii of bends can accommodate the largest construction vehicle. The dimensions will be communicated as part of the detail design stage as per Geometric Design Standard guidelines.

The construction and decommissioning phases of a solar energy facility are the only significant traffic generators and therefore noise and dust pollution will be higher during these phases. The duration of these phases is of temporary nature, i.e., the impact of the solar energy facility on the external traffic on the surrounding road network is temporary and solar facilities, when operational, do not add any significant traffic to the road network.

It should be noted that changes to the internal layout of the facility such as location of buildings, location of electrical infrastructure, and technology options for the BESS will not affect the traffic impact on the surrounding road network (as assessed in this report). These alternatives will have the same implications and are considered equally acceptable from a transport perspective.

The proposed development of the Rhino and Sunnyside Solar PV Energy Facility is supported from a traffic engineering perspective provided that the recommended mitigation measures are adhere to.

11 REFERENCES

- Road Traffic Act, 1996 (Act No. 93 of 1996)
- National Road Traffic Regulations, 2000
- SANS 10280/NRS 041-1:2008 - Overhead Power Lines for Conditions Prevailing in South Africa
- Transnetportterminals.net. n.d. *Transnet Port Terminals*. [online] Available at: <https://www.transnetportterminals.net/Ports/Pages/default.aspx>
- 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

Annexure A: Specialist Expertise

SUMMARY OF EXPERIENCE

Iris is a Professional Engineer registered with ECSA (20110156) and obtained her Master of Science degree in Civil Engineering in Germany in 2003. She has more than 20 years of experience in a wide field of traffic and transport engineering projects.

Iris left Germany in 2003 and has gained work experience as a traffic and transport engineer in South Africa and Germany. She has technical and professional skills in traffic impact studies, public transport planning, non- motorised transport planning and design, design and development of transport systems, project planning and implementation for residential, commercial, and industrial projects.

Her passions are the renewable energies and road safety, and she is highly experiences in providing traffic and transport engineering advise.

Iris is registered with the International Road Federation as a Global Road Safety Audit Team Leader and is a regular speaker at conferences, seminars and similar.

PROFESSIONAL REGISTRATIONS & INSTITUTE MEMBERSHIPS

PrEng	Registered with the Engineering Council of South Africa No. 20110156 Registered Mentor with ECSA
MSAICE	Member of the South African Institution of Civil Engineers
ITSSA	Member of ITS SA (Intelligent Transport Systems South Africa)
SAWEA	Member of the South African Wind Energy Association
SARF	South African Road Federation: Committee Member of Council
SARF WR	South African Road Federation Western Region – Chair
SARF RSC	South African Road Federation National Road Safety Committee
IRF	Registered as International Road Safety Audit Team Leader

EDUCATION

1996 – Matric (Abitur)	Carl Friedrich Gauss Schule, Hemmingen, Germany
1998 - Diploma (Draughtsperson)	Lower Saxonian State Office for Road Engineering
2002 – BSc Eng (Civil)	Leibniz Technical University of Hannover, Germany
2003 - MSc Eng (Civil & Transpt)	Leibniz Technical University of Hanover, Germany

Master Thesis on the Investigation of the allocation of access rights *to the European rail network infrastructure - Research of the feasibility of the different bidding processes to allocate access rights of railway operators in the European railway market. Client: Technical University of Berlin and German Railway Company.*

SUMMARY OF EXPERIENCE

iWink Consulting (Pty) Ltd – Independent Consultant

2022 – present
Position: Independent Consultant – working as an independent Specialist in the field of Traffic & Transport Engineering, Renewable Energies and Road Safety.

JG Afrika (Pty) Ltd (Previously Jeffares & Green (Pty) Ltd)

2016 – 2022
Position: Associate / Division Head: Traffic & Transport Engineering

Jeffares & Green (Pty) Ltd

2012 – 2016
Position: Senior Traffic & Transport Engineer

Arup (Pty) Ltd

2010 - 2012
Position – Senior Traffic & Transport Engineer

Arup (Pty) Ltd

2004 - 2010
Position – Traffic & Transport Engineer

Schmidt Ingenieursbüro, Hannover, Germany

2000
Position – Engineering Assistant

Leibniz University of Hannover, Germany

2000 - 2003
Position – Engineering Researcher - Institute for Road & Railway Engineering

SELECTION OF PROJECTS

Please note: The below lists show only a *selection* of projects that Iris has been involved in over the last 20 years. More information and a complete Schedule of Experience can be made available on request.

RENEWABLE ENERGY PROJECTS

Transport Impact Assessments /Traffic Management Plans for:

- Naos Solar PV Projects
- Ujekamanci Wind Energy Projects
- Mayogi Solar PV Project
- AGV Red Sands Solar Project
- Cradock – Kaladokhwe WEFs
- Britstown WEFs
- Highveld Solar Cluster
- Dealsville & Bloemfontein Solar PV
- Great Karroo Wind and Solar Cluster
- Ummbila Emoyeni Solar Project
- Poortjie Wind&Solar
- Hydra B Solar Cluster
- Choje Windfarm, Eastern Cape
- Richards Bay Gas to Power Project
- Oya Black Mountain Solar Project
- De Aar Solar Project
- Euronotus Wind & Solar Cluster
- Pienaarspoort Wind Energy Project
- Karreebosch Wind Energy Project
- Dyasonsklip Solar Project
- Kuruman Windfarm
- Bloemsmond Solar Farms
- Hendrina Wind Energy Project
- Orkney Solar Project
- Bulskop Solar Project
- Hyperion Solar & Thermal Project
- Gromis & Komas Wind Energy Projects
- Kudusberg & Rondekop Wind Energy Projects
- Bayview Windfarm
- Coega West Windfarm
- Suikerbekkie Solar Project

- Poortjie Solar Project
- Northam Solar Project
- Sibanye Solar Project
- Du Plessis Dam Solar Project
- Mercury Solar Project
- Aberdeen Wind Energy Project
- Saldanha Wind and Solar Projects
- Ummbila Emoyeni Wind Energy Project
- Springhaas Solar Project

Clients:

- G7 Energies
- ABO Wind Renewable Energies
- Atlantic Renewable Energy Partners
- Mulilo
- Acciona
- Enel
- Engie
- DNV GL
- Enertrag
- Scatec Solar
- Red Rocket Energies
- Windlab
- Mainstream
- Africoast
- Genesis

FURTHER PROJECTS

Traffic Impact Studies & Site Development Plan Input:

- Nooiensfontein Housing Development, City of Cape Town
- Belhar Housing Development, City of Cape Town
- Baredale Phase 7, City of Cape Town
- Beau Constantia Wine Farm
- Constantia Glen Wine Farm
- Eagles Nest Wine Farm
- Groenvallei Parking Audit, City of Cape Town
- Kosovo Housing Development, Western Cape Government
- Enkanini Housing Development, Stellenbosch
- Delft Housing Development, City of Cape Town
- Secunda Sasol, Free State
- Marula Platinum Mine
- InnerCity Transport Plan, City of Cape Town
- Stellenbosch Road Master Plan
- Nyanga Public Transport Interchange

- Crawford Campus Cape Town
- Durban RoRo Car Terminal, Transnet
- Durban Farewell Container Site
- Msunduzi Waterfront Housing Development
- Transnet Park Site – Traffic Management and Evacuation Plans
- UWC Bellville Medical Campus
- Bloekombos District Hospital
- Malabar Extension 3, Port Elizabeth

Traffic Engineering for Roads Projects:

- Ekhurhuleni Bus Stops and Intersection Safety Assessments
- Namibia Noordoewer to Rosh Pina, Road Agency Namibia
- N2 Section 19 Mthatha – NMT Studies
- R63 Alice to Fort Beaufort – NMT, Road Link and Intersection Studies
- N2 Kangela to Pongola Upgrade
- Cofimvaba Eastern Cape – NMT, Road and Intersection Upgrades
- Stellenbosch R44 Traffic Signals
- Secunda Traffic Signals
- Fezile Dabi District Gravel Roads Upgrade, Free State Province
- Zambia RD Rehabilitation Project
- R61 Eastern Cape – NMT Studies, SANRAL

CONTINUED PROFESSIONAL DEVELOPMENT (CPD)

*Last five years*full CPD list available*

2023 – International Traffic Safety Conference, Doha – Speaker

2022 – 7th Regional Conference for Africa & PIARC International Seminar on Rural Roads and Road Safety - Speaker

2022 – Non-motorised Transport Seminar (SARF) – Co-Organizer / Speaker

2021 – SARF KZN Road Safety Considerations (SARF) – Guest Speaker

2021 – Road Safety Audit Course (IRF) – Guest Speaker

2021 – Legal Obligations / Road Safety Act (SARF) – Presenter

2020 – Understanding Road Accidents (SARF)

2020 – Road Safety Auditor Course (SARF) – Co-Lecturer

2018 – African Road Conference (IRF/SARF/PIARC)

2018 – Road Safety in Engineering (SARF) – Presenter

2016 - SATC Road Safety Audit Workshop Pretoria (SARF)

2015 - Non-motorised Transport Planning (SARF

Annexure B: Specialist Statement of Independence

I, Iris Sigrid Wink, 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: iWink Consulting (Pty) Ltd

Date: 06-02-2024

Annexure C: Impact Rating Methodology

1 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) METHODOLOGY

The Environmental Impact Assessment (EIA) Methodology assists in evaluating the overall effect of a proposed activity on the environment. Determining of the significance of an environmental impact on an environmental parameter is determined through a systematic analysis.

1.1 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale (i.e. site, local, national or global), whereas intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in **Table 1**.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

1.2 Impact Rating System

The impact assessment must take account of the nature, scale and duration of effects on the environment and whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the various project stages, as follows:

- Planning;
- Construction;
- Operation; and
- Decommissioning.

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

The significance of Cumulative Impacts should also be rated (As per the Excel Spreadsheet Template).

1.2.1 Rating System Used to Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the possible mitigation of the impact. Impacts have been consolidated into one (1) rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

Table 1: Rating of impacts criteria