# EIA REPORT:
# PROPOSED MORIRI
# SOLAR PHOTOVOLTAIC FACILITY,
# NORTHERN CAPE PROVINCE

## TRANSPORT STUDY

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**First Issue**


Prepared by:

**JG AFRIKA (PTY) LTD**

Branch: Cape Town
PO Box 38561
Postal code: 7430
Telephone: 021 530 1800

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| **JG AFRIKA (PTY) LTD**<br>**CAPE TOWN**<br><br>14 Central Square<br>Pinelands<br>7405<br><br>Tel.: +27 21 530 1800<br>Email: wink@jgafrika.com | **Savannah Environmental (Pty) Ltd**<br>**WOODMEAD**<br><br>First Floor, Block 2<br>5 Woodlands Drive Office Park<br>Cnr Woodlands Drive & Western Service Road<br>Woodmead, 2191<br><br>Tel: 27 011 656 3237<br>Email: joanne@savannahsa.com |
| **AUTHOR** | **CLIENT CONTACT PERSON** |
| A Johnson | J Thomas |



**SYNOPSIS**

Preparation of a Transport Study for the Proposed Moriri Solar Photovoltaic Facility in the Northern Cape Province, pertaining to all relevant traffic and transportation engineering aspects.



**KEY WORDS:**

EIA Report, Solar Energy, Transport Study, Photovoltaic, PV




**QUALITY VERIFICATION**

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

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| Checked by: | Associate | I Wink | | 15/03/2022 |
| Authorised by: | Director | D Petersen | | 15/03/2022 |
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# PROPOSED MORIRI SOLAR PHOTOVOLTAIC FACILITY, NORTHERN CAPE PROVINCE

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## 1 INTRODUCTION AND METHODOLOGY

### 1.1 Scope and Objectives

Great Karoo Renewable Energy (Pty) Ltd is proposing the construction and operation of a photovoltaic (PV) solar energy facility and associated infrastructure on Portion 0 of Farm Rondavel 85, located approximately 35km south-west of Richmond and 80km south-east of Victoria West, within the Ubuntu Local Municipality and the Pixley Ka Seme District Municipality in the Northern Cape Province, as shown in **Figure 1-1.**

The project is planned as part of a larger cluster of renewable energy projects, which include two (2) 140MW Wind Energy Facilities (known as Merino Wind Farm and Angora Wind Farm) two (2) additional 100MW PV facilities (known as Nku Solar PV and Kwana Solar PV), as well as the grid connection infrastructure connecting the renewable energy facilities to the existing Eskom Gamma Substation.

A preferred project site with an extent of ~29 909ha and a development area of ~577ha within the project site has been identified by Great Karoo Renewable Energy (Pty) Ltd as a technically suitable area for the development of the Moriri Solar PV Facility with a contracted capacity of up to 100MW.


*Figure 1-1: Proposed Moriri Solar PV Facility*

As part of the Environmental Impact Assessment (EIA) process undertaken, the services of a Transportation Specialist are required to conduct a Transport Study.

The following two main transportation activities will be investigated:

- Abnormal load vehicles transporting components to the site.
- The transportation of construction materials, equipment and people to and from the site/facility.

The transport study will aim to provide the following objectives:

- Assess activities related to traffic movement for the construction and operation (maintenance) phases of the facility.
- Recommend a preliminary route for the transportation of the components to the proposed site.
- Recommend a preliminary transportation route for the transportation of materials, equipment and people to site.
- Recommend alternative or secondary routes where possible.

## 1.2 Terms of Reference

General:

A specialist report prepared in terms of the Regulations must 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.

## 1.3 Approach and Methodology

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

- during the construction of the access roads;
- construction of the facility; and
- operation and maintenance during the operational phase.

This transport study was informed by the following:

<u>Site Visit and Project Assessment</u>

- Overview of project background information including location maps, component specs and any possible resulting abnormal loads to be transported.

- Research of all available documentation and information relevant to the proposed facility; and
- Site visit to gain sound understanding of the project.

The transport study considered and assessed the following:

Traffic and Haul Route Assessment

- Estimation of trip generation;
- Discussion on potential traffic impacts;
- Assessment of possible haul routes; and
- Construction and operational (maintenance) vehicle trips.

Site layout, Access Points and Internal Roads Assessment per Site

- Description of the surrounding road network;
- Description of site layout;
- Assessment of the proposed access points; and
- Assessment of the proposed internal roads on site.

## 1.4 Assumptions and Limitations

The following assumptions and limitations apply:

- This study is based on the project information provided by Savannah Environmental (Pty) Ltd.
- According to the Eskom Specifications for Power Transformers (Eskom Power Series, Volume 5: Theory, Design, Maintenance and Life Management of Power Transformers), the following dimensional limitations need to be kept when transporting the transformer – total maximum height 5 000mm, total maximum width 4 300 mm and total maximum length 10 500 mm.
- Maximum vertical height clearances along the haulage route are 5.2 m for abnormal loads.
- Imported elements will be transported from the most feasible port of entry, which is deemed to be Port of Ngqura.
- If any elements are manufactured within South Africa, these will be transported from their respective manufacturing centres, which would be either in the greater Johannesburg area for the transformer, inverter and the support structures and in Pinetown/Durban, Cape Town or Johannesburg for the PV modules.
- All haulage trips will occur on either surfaced national and provincial roads or existing gravel roads.
- Construction materials will be sourced locally as far as possible.

## 1.5 Source of Information

Information used in a transport study includes:

- Project Information provided by the Client;
- Google Earth.kmz provided by the Client;
- Google Earth Satellite Imagery;
- 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
- 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
- Information gathered during the site visit; and
- Project research of all available information.

# 2 DESCRIPTION OF PROJECT ASPECTS RELEVANT TO THE TRANSPORT STUDY

## 2.1 Port of Entry

It is assumed that if components are imported to South Africa, it will be via the Port of Ngqura, which is located in the Eastern Cape. The Port is located approximately 425km from the proposed site. The Port of Ngqura is a world-class deep-water transshipment 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.

Alternatively, components can be imported via the Port of Saldanha in the Western Cape. The Port of Saldanha, located 675km from the proposed site, is the largest and deepest natural port in the Southern Hemisphere able to accommodate vessels with a draft of up to 21.5m.

## 2.2 Transportation requirements

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

- Conventional trucks within the freight limitations to transport building material to the site;
- 40ft container trucks transporting solar panels, frames and the inverter, which are within freight limitations;
- Flatbed trucks transporting the solar panels 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.

## 2.3 Abnormal Load Considerations

It is expected that the transformers will be transported with an abnormal load vehicle. Abnormal permits are required for vehicles exceeding the following permissible maximum dimensions on road freight transport in terms of the Road Traffic Act (Act No. 93 of 1996) and the National Road Traffic Regulations, 2000:

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

## 2.4 Further Guideline Documentation

The Technical Recommendations for Highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outlines the rules and conditions that apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges and culverts.

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

## 2.5 Permitting – General Rules

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

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

## 2.6 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.

## 2.7 Dimensional Limitations

A load of abnormal dimensions may cause an obstruction and danger to other traffic. For this reason, all loads must, as far as possible, conform to the legal dimensions. Permits will only be considered for indivisible loads, i.e. loads that cannot, without disproportionate

effort, expense or risk of damage, be divided into two or more loads for the purpose of transport on public roads. For each of the characteristics below there is a legally permissible limit and what is allowed under permit:

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

## 2.8 Transporting Other Plant, Material and Equipment

In addition to transporting the specialised equipment, the normal Civil Engineering construction materials, plant and equipment will need to be transported to the site (e.g. sand, stone, cement, gravel, water, compaction equipment, concrete mixers, etc.). Other components, such as electrical cables, pylons and substation transformers, will also be transported to site during construction. The transport of these items will generally be conducted with normal heavy loads vehicles, except for the transformers which require an abnormal load vehicle.

# 3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

## 3.1 Description of the site

The proposed Moriri Solar PV facility will be located east of Victoria West, as shown in **Figure 3-1**. The proposed site is bounded by an existing gravel road located between the N1 and Hutchinson in the west.


*Figure 3-1: Aerial View of the Proposed Moriri Development*

The Moriri Solar PV Facility project site is proposed to accommodate the following infrastructure, which will enable the facility to supply a contracted capacity of up to 100MW:

- Solar PV array comprising PV modules and mounting structures.
- Inverters and transformers.
- Cabling between the panels.
- 33/132kV onsite facility substation.
- Cabling from the onsite substation to the collector substation (either underground or overhead).
- Electrical and auxiliary equipment required at the collector substation that serves that solar energy facility, including switchyard/bay, control building, fences, etc.
- Battery Energy Storage System (BESS).
- Site offices and maintenance buildings, including workshop areas for maintenance and storage.
- Laydown areas.
- Access roads and internal distribution roads.

The solar PV facility is proposed in response to the identified objectives of the national and provincial government and local and district municipalities to develop renewable energy facilities for power generation purposes. It is the developer's intention to bid the Moriri Solar PV Facility under the Department of Mineral Resources and Energy's (DMRE's) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme, with the aim of evacuating the generated power into the national grid. This will aid in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the Integrated Resource Plan (IRP) with the Moriri Solar PV Facility set to inject up to 100MW into the national grid.

## 3.2 National Route to Site for Imported Components

There are two viable options for the port of entry for imported components - the Port of Ngqura in the Eastern Cape and the Port of Saldanha in the Western Cape.

The Port of Ngqura is located approximately 425km travel distance from the proposed site whilst the Port of Saldanha is located approximately 675km travel distance from the proposed site. The Port of Ngqura is the preferred port of entry, however, the Port of Saldanha can be used as an alternative should the Port of Ngqura not be available.

The preferred route from the Port of Ngqura is shown in green in **Figure 3-2** below. The route is 425km and follows the R75 north, passing Wolwefontein and Jansenville, and onto the R63 at Graaf-Reinet. The vehicles will travel on the R63 to the N1, passing Murraysburg, and continue on the N1 to the proposed site.

The alternative route from the Port of Saldanha, shown in orange in **Figure 3-2**, will follow the R45 east to Moorreesburg before taking the R46 east to Ceres. Vehicles will head east on the N1, passing Laingsburg and Beaufort West before reaching the access to the proposed site.


*Figure 3-2: Preferred and Alternative Routes*

It is critical to ensure that the abnormal load vehicle will be able to move safely and without obstruction along the preferred route. The preferred route should be surveyed prior to

construction to identify any problem areas, e.g., intersections with limited turning radii and sections of the road with sharp horizontal curves or steep gradients, that may require modification. After the road modifications have been implemented, it is recommended to undertake a “dry-run” with the largest abnormal load vehicle, prior to the transportation of any components, to ensure that the delivery will occur without disruptions.

It needs to be ensured that the gravel sections 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.

## 3.3 Route for Components manufactured locally

As mentioned in Section 1.4 (Assumptions and Limitations), it is anticipated that elements manufactured within South Africa will be transported to the site from the Cape Town, Johannesburg and Pinetown/Durban areas. It is also assumed that the transformer, which will be transported with an abnormal load vehicle, will be transported from the Johannesburg area and therefore it needs to be verified that the route from the manufacturer to the site does not have any load limitations for abnormal vehicles. At this stage, only a high-level assessment can be undertaken as no information of the exact location of the manufacturer is known and all road structures (such as bridges and culverts) need to be confirmed for their load bearing by SANRAL or the respective Roads Authority.

## 3.4 Route from Cape Town to Proposed Site

Components, such as PV panels, manufactured in Cape Town will be transported to site via road as shown in **Figure 3-3**. Haulage vehicles will travel from Cape Town on N1 to the proposed site, passing Laingsburg and Beaufort West.

Haulage vehicles will mainly travel on the national highway and the total distance to the proposed site is approximately 609km.


*Figure 3-3: Route from Cape Town to Proposed Site*

## 3.5 Route from Johannesburg to Proposed Site

It is assumed that the inverter and support structure will be manufactured in the Johannesburg area and transported to site via the N1. The travel distance is around 791km and no road limitations are expected on this route for normal loads vehicles as it will mainly follow national and provincial roads. The route is shown in **Figure 3-4**.

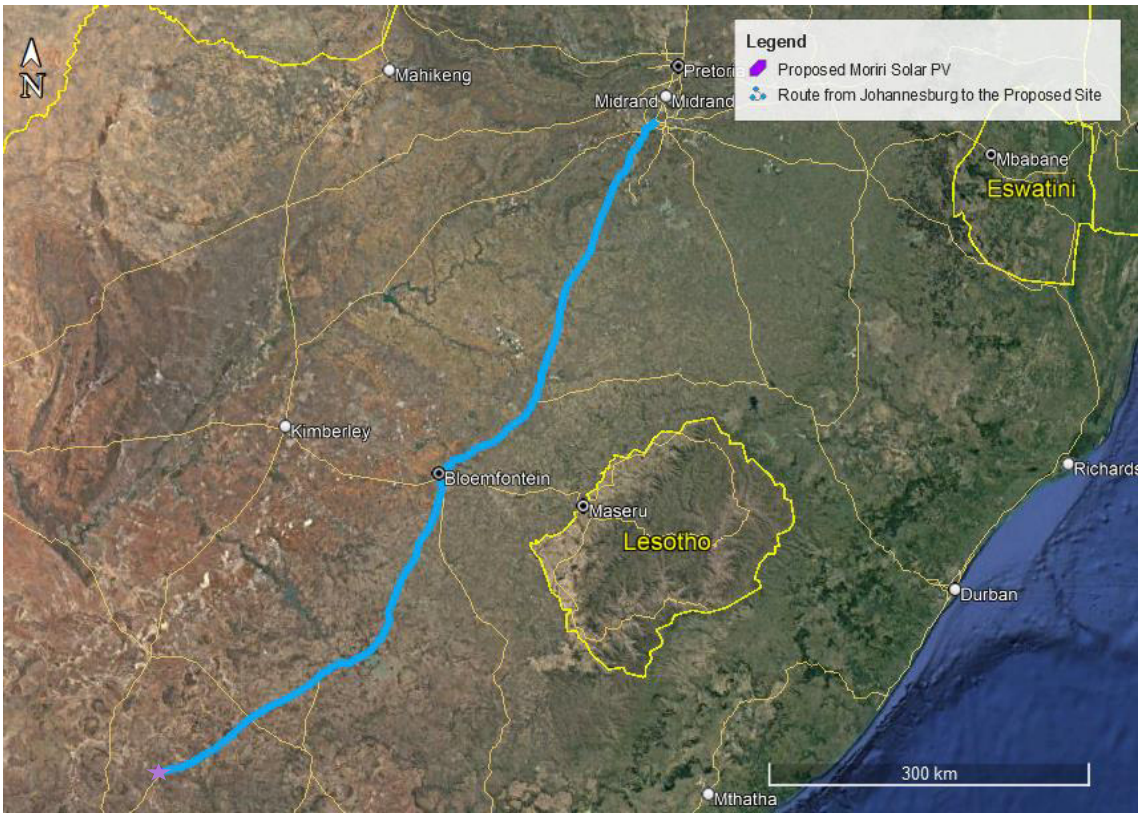


*Figure 3-4: Route from Johannesburg to Proposed Site*

## 3.6 Route from Pinetown / Durban to Proposed Site

If the PV panels are manufactured in South Africa, they could possibly be manufactured in the Pinetown area, close to Durban and transported to site via road. These elements are normal loads and no road limitations are expected along the routes, which is shown in **Figure 3-5**. Haulage vehicles will mainly travel on national and provincial roads and the total distance to the proposed site is approximately 1 030km.

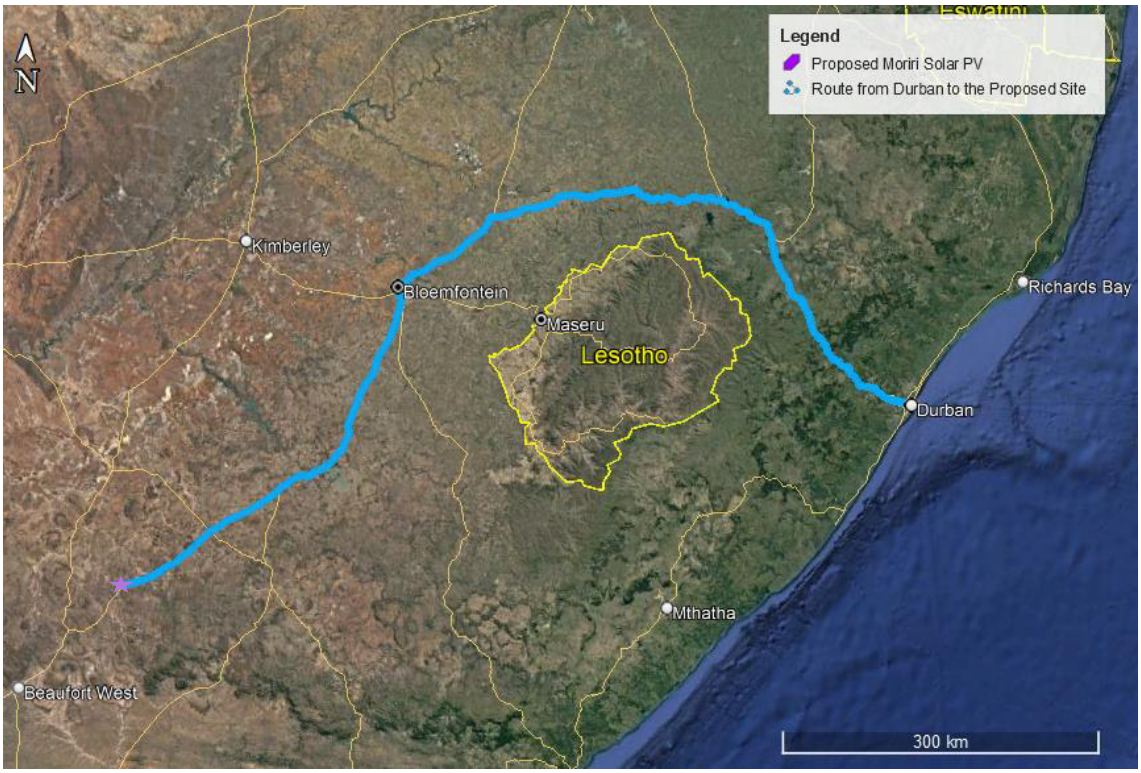


*Figure 3-5: Route from Durban to Proposed Site*

## 3.7 Route from Johannesburg Area to Site – Abnormal Load

It is assumed that the transformer will be manufactured locally in South Africa and be transported from the Johannesburg area to site. As the transformer will be transported with an abnormal load vehicle, the route planning needs a more detailed investigation of the feasible routes considering any limitations due to existing road features. Furthermore, a load of abnormal dimensions may cause an obstruction and danger to other traffic and therefore the transformer needs to be transported as far as possible on roads that are wide enough for general traffic to pass. It is expected that the transformer can be transported to site via the same route used for normal loads.

There are several bridges and culverts along this route, which need to be confirmed for load bearing and height clearances. There are several turns along the way and small towns to pass through. According to the desktop study, all turning movements along the route are manageable for the abnormal vehicle.

However, there are many alternative routes which can be investigated if the above route or sections of the route should not be feasible.

## 3.8 Proposed main access road to the Proposed Development

The proposed main access road to the site is an existing gravel road between the N1 and Hutchinson, as shown in **Figure 3-6**. The proposed access road will link to the internal road network of the facility.

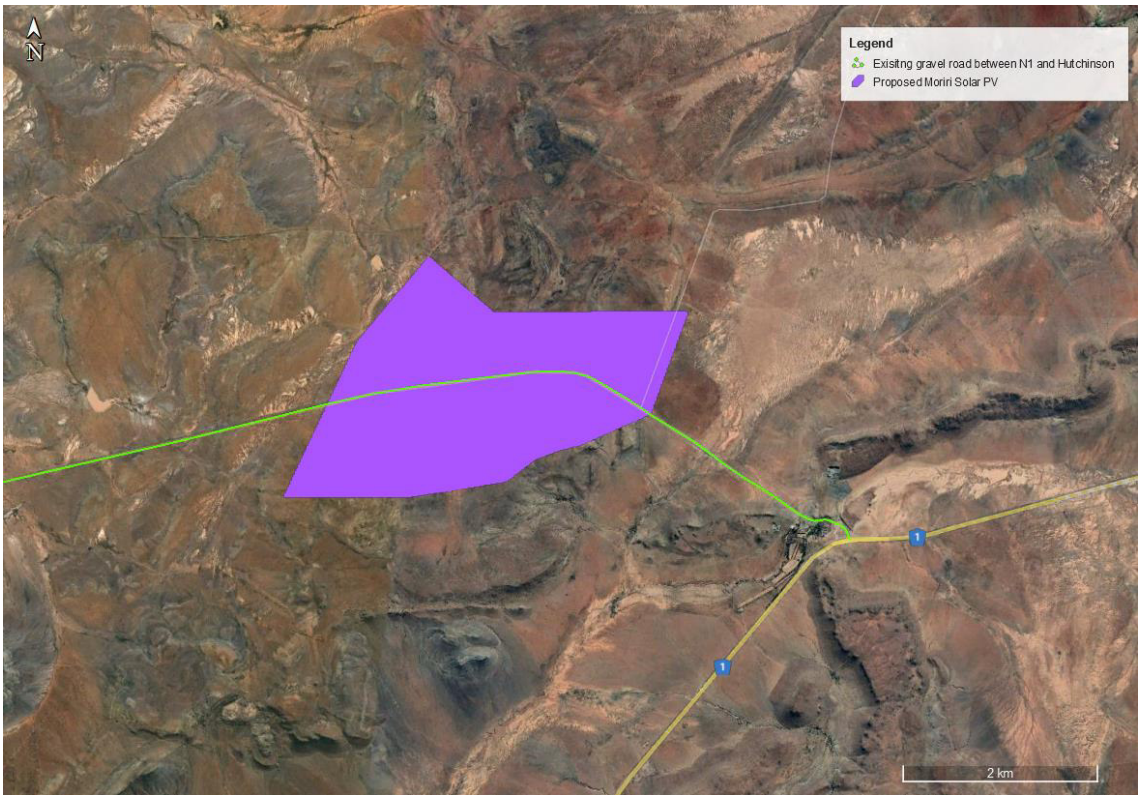


*Figure 3-6: Proposed Access Road*

The **proposed access road to the development is deemed suitable** as it is an existing gravel road.

A minimum required road width of 4 m needs to be maintained and all turning radii must conform with the specifications needed for the abnormal load vehicles and haulage vehicles. It needs to be ensured that the gravel sections of the haulage routes remain in good condition and will hence need to be maintained during the additional loading of the construction phase and then reinstated after construction is completed. The gravel roads will require grading with a grader to obtain a flat even surface and the geometric design of these gravel roads needs to be confirmed at detailed design stage.

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

The nearest towns in relation to the proposed development site are Richmond and Victoria-West. It is envisaged that most materials, water, plant, services and people will be procured within a 50km radius of the proposed facility. The nearest major town, Beaufort West, is located approximately 140km from the proposed development site.

Concrete batch plants and quarries in the vicinity could be contracted to supply materials and concrete during the construction phase, which would reduce the impact on traffic on the surrounding road network. Alternatively, mobile concrete batch plants and temporary construction material stockpile yards could be commissioned on vacant land near the proposed site. Delivery of materials to the mobile batch plant and the stockpile yard could be staggered to minimise traffic disruptions.

It is envisaged that most materials, water, plant, services and people will be procured within a 100km radius from the proposed site; however, this would be informed by the REIPPPP requirements.

# 4 APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

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

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

# 5 IDENTIFICATION OF KEY ISSUES

## 5.1 Identification of Potential Impacts

The potential transport related impacts are described below.

### 5.1.1 Construction Phase

*Potential impact*

- Construction related traffic
- The construction traffic would also lead to noise and dust pollution.
- This phase also includes the construction of roads, excavations, trenching for electrical cables and other ancillary construction works that will temporarily generate the most traffic.

### 5.1.2 Operational Phase

During operation, it is expected that staff and security will periodically visit the facility. It is assumed that approximately 20 full-time employees will be stationed on site. The traffic generated during this phase will be minimal and will not have an impact on the surrounding road network.

### 5.1.3 Cumulative Impacts

- Traffic congestion/delays on the surrounding road network.
- Noise and dust pollution

# 6 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

## 6.1 Potential Impact (Construction Phase)

### 6.1.1 Nature of the impact

- Potential traffic congestion and delays on the surrounding road network and associated noise and dust pollution.

### 6.1.2 Significance of impact without mitigation measures

- Traffic generated by the construction of the facility will have a significant impact on the surrounding road network. The exact number of trips generated during construction will be determined by the contractor, the haulage company transporting the components to site, the staff requirements and where equipment is sourced from.

### 6.1.3 Trip generation - Construction Phase

From experience on other projects of similar nature, the number of heavy vehicles per 7MW installation is estimated to range between 200 and 300 trips depending on the site conditions and requirements. For the 100MW, the total trips can therefore be estimated to be between 2 857 and 4 286 heavy vehicle trips, which will generally be made over a 12-month construction period. Choosing the worst-case scenario of 4 286 heavy vehicles over a 12-month period travelling on an average of 22 working days per month, the resulting daily number of vehicle trips is 17. Considering that the number of vehicle trips during peak hour traffic in a rural environment can roughly be estimated at around 20-40% of the average daily traffic, the resulting vehicle trips for the construction phase are approximately 4-7 trips.

If the panels are imported instead of manufactured within South Africa, the respective shipping company will be able to indicate how the panels can be packed (for example using 2MW packages and 40ft containers). These can then be stored at the port and repacked onto flatbed trucks.

It is assumed that during the peak of the construction period, 200 employees will be active on site.

Staff trips are assumed to be:

*Table 6-1: Estimation of daily staff trips*

| Vehicle Type | Number of vehicles | Number of Employees |
|---|---|---|
| Car | 10 | 15 (assuming 1.5 occupants) |
| Bakkie | 20 | 30 ((assuming 1.5 occupants) |
| Taxi – 15 seats | 5 | 75 |
| Bus – 80 seats | 1 | 80 |
| **Total** | **36** | **200** |

It is difficult to accurately estimate the construction traffic for the transportation of materials as it depends on the type of vehicles, tempo of the construction, source/location

of construction material etc. However, it is assumed that at the peak of construction, approximately 150 construction vehicle trips will access the site per day.

The total estimated daily site trips are shown in the table below.

*Table 6-2: Estimation of daily site trips*

| Activity | Number of trips |
|---|---|
| Staff trips | 36 |
| Component delivery | 17 |
| Construction trips | 150 |
| **Total** | **203** |

The impact on general traffic is therefore deemed nominal as the 203 trips will be distributed across a 9hr working day. The majority of the trips will occur outside the peak hours.

The significance of the transport impact without mitigation measures during the construction phase can be rated as medium. However, considering that this is temporary and short term in nature, the impact can be mitigated to an acceptable level.

### 6.1.4 Significance of impact with mitigation measures

The proposed mitigation measures for the construction traffic will result in a minor reduction of the impact on the surrounding road network, but the impact on the local traffic will remain moderate as the existing traffic volumes are deemed to be low. The dust suppression, however, will result in significantly reducing the impact.

- The delivery of components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.
- Dust suppression of gravel roads during the construction phase, as required.
- Regular maintenance of gravel roads by the Contractor during the construction phase and by the Owner/Facility Manager during the operation phase.
- The use of mobile batch plants and quarries near the site would decrease the traffic impact on the surrounding road network.
- Staff and general trips should occur outside of peak traffic periods as far as possible.
- If required, low hanging overhead lines (lower than 5.1m) e.g., Eskom and Telkom lines, along the proposed routes will have to be moved to accommodate the abnormal load vehicles.
- The preferred route should be surveyed to identify problem areas (e.g., intersections with limited turning radii and sections of the road with sharp horizontal curves or steep gradients, that may require modification). After the road modifications have been implemented, it is recommended to undertake a “dry-run” with the largest abnormal load vehicle, prior to the transportation of any components, to ensure that delivery will occur without disruptions. This process is to be undertaken by the haulage company transporting the components and the contractor, who will modify the road and intersections to accommodate abnormal vehicles. It needs to be ensured that the gravel sections

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.

- Design and maintenance of internal roads. The internal gravel roads will require grading with a grader to obtain a flat even surface and the geometric design of these gravel roads needs to be confirmed at detailed design stage. This process is to be undertaken by a civil engineering consultant or a geometric design professional.

## 6.2 Potential Impact (Operational Phase)

### 6.2.1 Nature of the impact

- Potential traffic congestion and delays on the surrounding road network.

### 6.2.2 Significance of impact without mitigation measures

- Traffic during the operation phase will include occasional maintenance requirements and staff trips.
- The number of water tanks needed for cleaning the panels can be significant However, water related trips are expected to not occur more than four times a year.

### 6.2.3 Trip Generation – Operational Phase

During operation, it is assumed that approximately 20 full-time employees will be stationed on site and hence vehicle trips generated are low and will have a negligible impact on the external road network. Traffic during the operational phase will be low (less than 10 trips) as trips will only be for occasional maintenance requirements and staff trips (assumed at 20 permanent staff).

The developer is investigating the use of borehole water for the cleaning of the PV panels. Should borehole water not be available or suitable, the following assumptions have been made to estimate the resulting trips generated from transporting water to the site:

- 5 000 litre water bowsers to be used for transporting the water
- Approximately 5 litres of water needed per panel

As no exact number was provided by the client at the time of preparing this study, the total number of panels was estimated to be approximately 500 000. The total number of trips would be 500 for the 500 000 panels. Given the high number of vehicle trips, boreholes and on-site water storage tanks should be investigated to reduce this number of trips. Panels are generally cleaned up to four times a year. To further limit the impact of water related trips on the external roads, it is recommended to schedule these trips outside of peak traffic periods and to spread the cleaning of the panels over a week.

### 6.2.4 Significance of impact with mitigation measures

The operational trips generated will be acceptable and will have a low to medium impact on the external road network.

- Staff and general (maintenance) trips should occur outside of peak traffic periods as far as possible.
- The provision of water storage tanks and/or boreholes.

- Water bowsers trips should occur outside of peak traffic periods as far as possible.
- Spread the cleaning of the panels over a week.
- Using a larger water bowser.

## 7 NO-GO ALTERNATIVE

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

# 8 IMPACT ASSESSMENT SUMMARY

The assessment of impacts and recommendation of mitigation measures as discussed above are collated in the tables below. The assessment methodology is attached as **Annexure B.**

## 8.1 Construction Phase

*Table 8-1: Impact Rating - Construction Phase – Traffic Congestion*

| | | | |
|---|---|---|---|
| ***Nature:***<br>**Traffic congestion during the construction phase** | | | |
| **Impact description:** The impact will occur due to added pressure on the road network due to the increase in traffic associated with the transport of equipment, material and staff to site during the construction phase. | | | |
| | **Rating** | **Motivation** | **Significance** |
| ***Prior to Mitigation*** | | | |
| **Duration** | Short-term (2) | The construction period will last between 1 – 2 years. | **Medium Negative (40)** |
| **Extent** | Local (2) | Pressure will only be added on the local road network. | |
| **Magnitude** | Moderate (6) | The increase in traffic will have a moderate impact on traffic operations. | |
| **Probability** | Highly Probable (4) | The possibility of the impact on the traffic operations is highly probable. | |
| ***Mitigation/Enhancement Measures*** | | | |
| ***Mitigation:***<br>• Stagger component delivery to site<br>• Reduce the construction period<br>• The use of mobile batch plants and quarries in close proximity to the site<br>• Staff and general trips should occur outside of peak traffic periods.<br>• Regular maintenance of gravel roads by the Contractor during the construction phase and by Client/Facility Manager during operation phase. | | | |
| ***Post Mitigation/Enhancement Measures*** | | | |
| **Duration** | Short-term (1) | The construction period will last between 1 – 2 years. | **Low Negative (15)** |
| **Extent** | Local (2) | Pressure will only be added on the local road network. | |
| **Magnitude** | Low (2) | The increase in traffic will have a low impact on traffic operations. | |
| **Probability** | Probable (3) | The possibility of the impact on the traffic operations is probable. | |
| ***Cumulative impacts:***<br>The duration of the construction phase is short term (i.e. the impact of the generated traffic on the surrounding road network is temporary and renewable energy facilities, when operational, do not add any significant traffic to the road network). Even if all renewable energy projects within the area are constructed 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. | | | |
| ***Residual Risks:***<br>Traffic will return to normal levels after construction is completed | | | |

*Table 8-2: Impact Rating - Construction Phase – Air Quality*

| | | | |
|---|---|---|---|
| ***Nature:***<br>**Air quality will be affected by dust pollution** | | | |
| **Impact description:** The impact will occur due to the increase in construction traffic associated with the transport of equipment, material and staff to site during the construction phase. | | | |
| | **Rating** | **Motivation** | **Significance** |
| ***Prior to Mitigation*** | | | |
| **Duration** | Short-term (2) | The construction period will last between 1 – 2 years. | **Medium Negative (36)** |
| **Extent** | Local (2) | Pressure will only be added on the local road network. | |
| **Magnitude** | Moderate (5) | The increase in traffic will have a moderate impact on traffic operations. | |
| **Probability** | Highly Probable (4) | The possibility of the impact on the traffic operations is highly probable. | |
| ***Mitigation/Enhancement Measures*** | | | |
| ***Mitigation:***<br>• Dust suppression of gravel roads during the construction phase, as required.<br>• Regular maintenance of gravel roads by the Contractor during the construction phase and by Client/Facility Manager during operation phase. | | | |
| ***Post Mitigation/Enhancement Measures*** | | | |
| **Duration** | Short-term (1) | The construction period will last between 1 – 2 years. | **Low Negative (15)** |
| **Extent** | Local (2) | Pressure will only be added on the local road network. | |
| **Magnitude** | Low (2) | The increase in traffic will have a low impact on traffic operations. | |
| **Probability** | Probable (3) | The possibility of the impact on the traffic operations is probable. | |
| ***Cumulative impacts:***<br>The duration of the construction phase is short term (i.e., the impact of the generated traffic on the surrounding road network is temporary and renewable energy facilities, when operational, do not add any significant traffic to the road network). Even if all renewable energy projects within the area are constructed 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. | | | |
| ***Residual Risks:***<br>Traffic will return to normal levels after construction is completed.<br>Dust pollution during the construction phase cannot be completely mitigated but mitigation measures will significantly reduce the impact. Dust pollution is limited to the construction period. | | | |

*Table 8-3: Impact Rating - Construction Phase – Noise Pollution*

| | | | |
|---|---|---|---|
| ***Nature:***<br>**Noise pollution due to the increase in traffic** | | | |
| **Impact description:** The impact will occur due to the increase in construction traffic associated with the transport of equipment, material and staff to site during the construction phase. | | | |
| | **Rating** | **Motivation** | **Significance** |
| ***Prior to Mitigation*** | | | |
| **Duration** | Short-term (2) | The construction period will last between 1 – 2 years. | **Medium Negative (36)** |
| **Extent** | Local (2) | Pressure will only be added on the local road network. | |
| **Magnitude** | Moderate (5) | The increase in traffic will have a moderate impact on traffic operations. | |
| **Probability** | Highly Probable (4) | The possibility of the impact on the traffic operations is highly probable. | |
| ***Mitigation/Enhancement Measures*** | | | |
| ***Mitigation:***<br>• Stagger component delivery to site<br>• Reduce the construction period as far as possible<br>• The use of mobile batch plants and quarries in close proximity to the site<br>• Staff and general trips should occur outside of peak traffic periods | | | |
| ***Post Mitigation/Enhancement Measures*** | | | |
| **Duration** | Short-term (1) | The construction period will last between 1 – 2 years. | **Low Negative (15)** |
| **Extent** | Local (2) | Pressure will only be added on the local road network. | |
| **Magnitude** | Low (2) | The increase in traffic will have a low impact on traffic operations. | |
| **Probability** | Probable (3) | The possibility of the impact on the traffic operations is probable. | |
| ***Cumulative impacts:***<br>The duration of the construction phase is short term (i.e., the impact of the generated traffic on the surrounding road network is temporary and renewable energy facilities, when operational, do not add any significant traffic to the road network). Even if all renewable energy projects within the area are constructed 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. | | | |
| ***Residual Risks:***<br>Traffic will return to normal levels after construction is completed.<br>Noise pollution during the construction phase cannot be completely mitigated but mitigation measures will significantly reduce the impact. Noise pollution is limited to the construction period. | | | |

## 8.2 Operational Phase

*Table 8-4: Impact Rating – Operational Phase*

| IMPACT TABLE – OPERATIONAL PHASE |
|---|
| *The traffic generated during this phase will be minimal and will have not have any impact on the surrounding road network.* |

## 8.3 Decommissioning Phase

*Table 8-5: Impact Rating- Decommissioning Phase*

| IMPACT TABLE – DECOMMISSIONING PHASE |
|---|
| *This phase will have a similar impact as the Construction Phase i.e., traffic congestion, air pollution and noise pollution, as similar trips/movements are expected.* |

## 9 CUMULATIVE IMPACTS

To assess the cumulative impact, it was assumed that all renewable energy projects within 50km currently proposed and authorized, would be constructed at the same time. This is the precautionary approach as in reality; these projects would be subject to a highly competitive bidding process. Only a handful of projects would be selected to enter into a power purchase agreement with Eskom, and construction is likely to be staggered depending on project-specific issues.

The construction and decommissioning phases are the only significant traffic generators for renewable energy projects. The duration of these phases is short term (i.e., the impact of the generated traffic on the surrounding road network is temporary and renewable energy facilities, when operational, do not add any significant traffic to the road network). Even if all renewable energy projects within the area are constructed 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 assessments of cumulative impacts are collated in the table below.

*Table 9-1: Cumulative Impact rating*

| ***Nature:*** *Traffic generated by the proposed development and the associated noise and dust pollution.* | | |
|---|---|---|
| | **Overall impact of the proposed project considered in isolation (post mitigation)** | **Cumulative impact of the project and other projects in the area** |
| ***Extent*** | Local (2) | High (5) |
| ***Duration*** | Short (1) | Medium-term (3) |
| ***Magnitude*** | Low (2) | High (8) |
| ***Probability*** | Probable (3) | Improbable (2) |
| ***Significance*** | **Low (15)** | **Medium (32)** |
| ***Status (positive/negative)*** | Negative | Negative |
| ***Reversibility*** | High | High |
| ***Loss of resources?*** | No | No |
| ***Can impacts be mitigated?*** | Yes | Yes |
| ***Confidence in findings:*** High. | | |
| ***Mitigation:***<br>• *Stagger component delivery to site*<br>• *Dust suppression*<br>• *Reduce the construction period*<br>• *The use of mobile batch plants and quarries in close proximity to the site*<br>• *Staff and general trips should occur outside of peak traffic periods* | | |

## 10 ENVIRONMENTAL MANAGEMENT PROGRAM INPUTS

OBJECTIVE: It is recommended that dust suppression and maintenance of gravel roads form part of the EMPr. This would be required during the Construction phase where an increase in vehicle trips can be expected. No traffic related mitigation measures are envisaged during the operational phase due to the negligible traffic volume generated during this phase.

| | |
|---|---|
| **Project component/s** | Construction Phase traffic |
| **Potential Impact** | Dust and noise pollution due to increase in traffic volume |
| **Activity/risk source** | Transportation of material, components, equipment and staff to site |
| **Mitigation: Target/Objective** | Minimize impacts on road network and surrounding communities |

| Mitigation: Action/control | Responsibility | Timeframe |
|---|---|---|
| • Stagger component delivery to site<br>• The use of mobile batch plants and quarries near the site would decrease the impact on the surrounding road network<br>• Dust suppression<br>• Reduce the construction period as far as possible<br>• Maintenance of gravel roads<br>• Apply for abnormal load permits prior to commencement of delivery via abnormal loads<br>• Assess the preferred route and undertake a 'dry run' to test<br>• Staff and general trips should occur outside of peak traffic periods as far as possible.<br>• Any low hanging overhead lines (lower than 5.1m) e.g., Eskom and Telkom lines, along the proposed routes will have to be moved to accommodate the abnormal load vehicles, if required | • Holder of the EA | • Before construction commences and regularly during construction phase |

| | |
|---|---|
| **Performance Indicator** | Staggering or reducing the construction trips will reduce the impact of dust and noise pollution. |
| **Monitoring** | • Regular monitoring of road surface quality.<br>• Monitoring congestion levels (increase in vehicle trips)<br>• Apply for required permits prior to commencement of construction |

## 11 CONCLUSION AND RECOMMENDATIONS

This report addressed key issues and alternatives to be considered for the proposed Moriri Solar PV Facility.

As it had not been decided at the time of undertaking the transport study which manufacturers will be contracted for the solar PV components, all possible haulage routes were included into this study.

The potential transport related impacts for the construction and operation phases for the proposed Moriri Solar PV Facility were assessed.

- The construction phase traffic, although significant, will be temporary and impacts are considered to have a **low significance**.
- During operation, it is expected that staff and security will periodically visit the facility. It is assumed that approximately 20 full-time employees will be stationed on site. The traffic generated during this phase will be minimal and will not have an impact on the surrounding road network.

The potential mitigation measures mentioned in the construction phase are:

- Dust suppression
- Component delivery to/ removal from the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.
- The use of mobile batch plants and quarries near the site would decrease the impact on the surrounding road network.
- Staff and general trips should occur outside of peak traffic periods.
- A “dry run” of the preferred route.
- Design and maintenance of internal roads.
- If required, any low hanging overhead lines (lower than 5.1m) e.g. Eskom and Telkom lines, along the proposed routes will have to be moved to accommodate the abnormal load vehicles.

The potential mitigation measures mentioned in the operational phase are:

- Staff and general (maintenance) trips should occur outside of peak traffic periods as far as possible.
- The provision of water storage tanks and/or boreholes.
- Water bowsers trips should occur outside of peak traffic periods as far as possible.
- Spread the cleaning of the panels over a week.
- Using a larger water bowser.

The construction and decommissioning phases of a development is the only significant traffic generator and therefore noise and dust pollution will be higher during this phase. The duration of this phase is short term i.e., the impact of the traffic on the surrounding road network is temporary and solar facilities, when operational, do not add any significant traffic to the road network.

The proposed access road located off the N1 is deemed a suitable access road as it is an existing gravel road i.e., less expensive to upgrade.

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

The impacts associated with the Moriri Solar PV Facility are acceptable with the implementation of the recommended mitigation measures and can therefore be authorised.

## 12 REFERENCES


- Google Earth Pro
- SANS 10280/NRS 041-1:2008 - Overhead Power Lines for Conditions Prevailing in South Africa
- Road Traffic Act (Act No. 93 of 1996)
- National Road Traffic Regulations, 2000
- 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

## 13 ANNEXURES

# *Annexure A – SPECIALIST EXPERTISE*

# IRIS SIGRID WINK

| | |
|---|---|
| **Profession** | Civil Engineer (Traffic & Transportation) |
| **Position in Firm** | Associate |
| **Area of Specialisation** | Manager: Traffic & Transportation Engineering |
| **Qualifications** | PrEng, MSc Eng (Civil & Transportation) |
| **Years of Experience** | 19 Years |
| **Years with Firm** | 9 Years |

## SUMMARY OF EXPERIENCE

Iris is a Professional Engineer registered with ECSA (20110156). She joined JG Afrika (Pty) Ltd. in 2012. Iris obtained a Master of Science degree in Civil Engineering in Germany and has more than 15 years of experience in a wide field of traffic and transport engineering projects. Iris left Germany in 2003 and has worked 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 and providing conceptual designs for the abovementioned. She has also been involved with transport assessments for renewable energy projects and traffic safety audits.

**PROFESSIONAL REGISTRATIONS & INSTITUTE MEMBERSHIPS**

**PrEng** - Registered with the Engineering Council of South Africa No. 20110156
Registered Mentor with ECSA for the Cape Town Office of JG Afrika
**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
**IRF** - Global Road Safety Audit Team Leader

**EDUCATION**

**1996 - Matric** – Matric (Abitur) – Carl Friedrich Gauss Schule, Hemmingen, Germany
**1998 - Diploma** as Draughtsperson – Lower Saxonian State Office for Road and Bridge Engineering
**2003 - MSc Eng** (Civil and Transportation) – Leibniz Technical University of Hanover, Germany

**SPECIFIC EXPERIENCE (Selection)**

**JG Afrika (Pty) Ltd (Previously Jeffares & Green (Pty) Ltd)**
**2016 – Date**
**Position –** Associate

- **Kudusberg Windfarm** – Transport study for the proposed Kudusberg Windfarm near Sutherland, Northern Cape – Client: G7 Renewable Energies
- **Kuruman Windfarm –** Transport study for the proposed Kuruman Windfarm in Kuruman, Northern Cape – Client: Mulilo Renewable Project Developments

- **Coega West Windfarm** – Transportation and Traffic Management Plan for the proposed Coega Windfarm in Coega, Port Elizabeth – Client: Electrawinds Coega
- **Traffic and Parking Audits** for the Suburb of Groenvallei in Cape Town – Client: City of Cape Town Department of Property Management.
- **Road Safety Audit** for the Upgrade of N1 Section 4 Monument River – Client: Aurecon on behalf of SANRAL
- **Sonop Windfarm** – Traffic Impact Assessment for the proposed Sonop Windfarm, Coega, Port Elizabeth – Client: Founders Engineering
- **Universal Windfarm** - Traffic Impact Assessment for the proposed Universal Windfarm, Coega, Port Elizabeth – Client: Founders Engineering
- **Road Safety Audit** for the Upgrade of N2 Section 8 Knysna to Wittedrift – Client: SMEC on behalf of SANRAL
- **Road Safety Audit** for the Upgrade of N1 Section 16 Zandkraal to Winburg South – Client: SMEC on behalf of SANRAL
- **Traffic and Road Safety Studies** for the Improvement of N7 Section 2 and Section 3 (Rooidraai and Piekenierskloof Pass) – Client: SANRAL
- **Road Safety Appraisal**s for Northern Region of Cape Town – Client: Aurecon on behalf of City of Cape Town (TCT)
- **Traffic Engineering Services** for the Enkanini Informal Settlement, Kayamandi - Client: Stellenbosch Municipality
- **Lead Traffic Engineer** for the Upgrade of a 150km Section of the National Route N2 from Kangela to Pongola in KwaZulu-Natal, Client: SANRAL
- **Traffic Engineering Services** for the Kosovo Informal Settlement (which is part of the Southern Corridor Upgrade Programme), Client: Western Cape Government
- **Traffic and Road Safety Studies** for the proposed Kosovo Informal Housing Development (part of the Southern Corridor Upgrade Program), Client: Western Cape Government.
- **Road Safety Audit** Stage 3 – Upgrade of the R573 Section 2 between Mpumalanga/Gauteng and Mpumalanga/Limpopo, Client: AECOM on behalf of SANRAL
- **Road Safety Audit** Stage 1 and 3 – Upgrade of the N2 Section 5 between Lizmore and Heidelberg, Client: Aurecon on behalf of SANRAL
- **Traffic Safety Studies** for Roads Upgrades in Cofimvaba, Eastern Cape – Client: Cofimvaba Municipality
- **Road Safety Audit** Stage 1 and 3 – Improvement of Intersections between Olifantshoek and Kathu, Northern Cape, Client: Nadeson/Gibb on behalf of SANRAL
- **Road Safety Audit** Stage 3 – Upgrade of the Beacon Way Intersection on the N2 at Plettenberg Bay, Client: AECOM on behalf of SANRAL
- **Traffic Impact Assessment** for a proposed Primary School at Die Bos in Strand, Somerset West, Client: Edifice Consulting Engineers
- **Road Safety Audit** Stage 1 and 3 – Improvement of R75 between Port Elizabeth and Uitenhage, Eastern Cape, Client: SMEC on behalf of SANRAL

# *Annexure B – ASSESSMENT METHODOLOGY*

***Assessment of Impacts***

Direct, indirect and cumulative impacts of the issues identified through the scoping study, as well as all other issues identified in the EIA phase must be assessed in terms of the following criteria:

» The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
» The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):
» The **duration**, wherein it will be indicated whether:
  - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
  - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
  - medium-term (5–15 years) – assigned a score of 3;
  - long term (> 15 years) - assigned a score of 4; or
  - permanent - assigned a score of 5;
» The **magnitude**, quantified on a scale from0-10, where a score is assigned:
  - 0 is small and will have no effect on the environment
  - 2 is minor and will not result in an impact on processes
  - 4 is low and will cause a slight impact on processes
  - 6 is moderate and will result in processes continuing but in a modified way
  - 8 is high (processes are altered to the extent that they temporarily cease)
  - 10 is very high and results in complete destruction of patterns and permanent cessation of processes
» The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring.
  Probability will be estimated on a scale of 1–5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).
» The **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
» The **status**, which will be described as either positive, negative or neutral.
» The degree to which the impact can be reversed.
» The degree to which the impact may cause irreplaceable loss of resources.
» The *degree* to which the impact can be *mitigated.*

The **significance** is calculated by combining the criteria in the following formula:
S=(E+D+M)P
S = Significance weighting
E = Extent
D = Duration
M =Magnitude
P = Probability

The **significance weightings** for each potential impact are as follows:

- < 30 points: Low (i.e., where this impact would not have a direct influence on the decision to develop in the area),
- 30-60 points: Medium (i.e., where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- > 60 points: High (i.e., where the impact must have an influence on the decision process to develop in the area).