BASIC ASSESSMENT REPORT: PROPOSED BULSKOP PV FACILITY AND ASSOCIATED INFRASTRUCTURE NEAR BEAUFORT WEST, WESTERN CAPE

TRANSPORT STUDY

April 2022
Second Issue

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SYNOPSIS

Preparation of a Transport Study for the Proposed Bulskop PV Facility and associated infrastructure located near Beaufort West in the Western Cape Province, pertaining to all relevant traffic and transportation engineering aspects.

KEY WORDS:

Transport Study, Solar Energy Facility, Solar PV Facility, 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.

Verification	Capacity	Name	Signature	Date
By Author	Senior Technologist	Adrian Johnson		12/04/2022
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PROPOSED BULSKOP PV FACILITY
AND ASSOCIATED INFRASTRUCTURE
NEAR BEAUFORT WEST, WESTERN CAPE

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NEAR BEAUFORT WEST, WESTERN CAPE

1 INTRODUCTION AND METHODOLOGY

1.1 Scope and Objectives

The Applicant, Bulskop PV (Pty) Ltd, is proposing the construction of a photovoltaic (PV) solar energy facility (known as the Bulskop PV) located on the Remaining Extent (Portion 0) of Farm 423 approximately 12 km south-east of Beaufort West in the Western Cape Province, as shown in **Figure 1-1**.

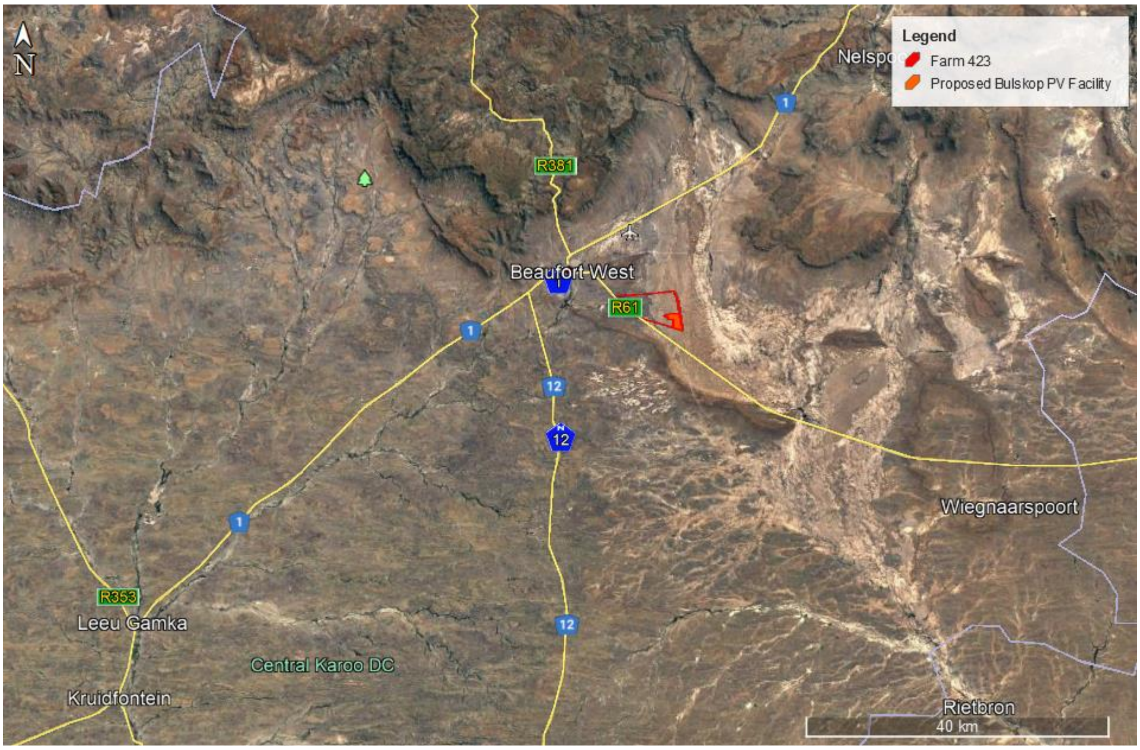

Figure 1-1: Locality Plan

The solar PV facility will comprise several arrays of PV panels and associated infrastructure and will have a contracted capacity of up to 120 MW. The project is situated within the Beaufort West Local Municipality within the Central Karoo District Municipality.

Five additional 120 MW PV facilities are concurrently being considered on the property and are assessed through separate Basic Assessment processes, namely:

- Hardeveld PV;
- Rosenia PV;
- Hoodia PV;
- Salsola PV; and
- Gamka PV.

A development footprint of approximately 268 ha is being assessed as part of this Basic Assessment Report (BAR) and the infrastructure associated with the 120 MW facility includes:

- PV modules and mounting structures;
- Inverters and transformers;
- Battery Energy Storage System (BESS);
- Site and internal access roads (up to 8 m wide);
- Auxiliary buildings (33 kV switch room, gatehouse and security, control centre, office, warehouse, canteen & visitors centre, staff lockers etc.);
- Perimeter fencing and security infrastructure;
- Rainwater Tanks;
- Temporary and permanent laydown area;
- Facility substation; and
- Own-build grid connection solution, including:
    - Up to 132 kV line between the project components and the facility substation (within a 50 m wide and 2 km in length corridor);

The Bulskop PV facility intends to connect to the National Grid via the Droerivier Main Transmission Substation (MTS) (approximately 17.5 km west of the facility), however, the grid connection infrastructure associated with this grid solution is being assessed as part of a separate Environmental Application.

As part of the Basic Assessment (BA) 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

The Terms of Reference for this Transport Study include the following:

General:

(a) details of-

- » the specialist who prepared the report; and
- » 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;

- » an indication of the quality and age of base data used for the specialist report
- » 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-

- » whether the proposed activity, activities or portions thereof should be authorised; and (considering impacts and expected cumulative impacts).
- » regarding the acceptability of the proposed activity or activities, and

» 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 Bulskop PV (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 5 000 mm, 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 Bulskop PV (Pty) Ltd.;
- Google Earth .kmz provided by Bulskop PV (Pty) Ltd.;
- Google Earth Satellite Imagery; 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 395 km 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 or the Port of Cape Town, both located in the Western Cape. The Port of Saldanha, located 555 km 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 21.5 m.

The Port of Cape Town (475 km from the proposed site) could be considered for the import of smaller components as the Port is not able to accommodate abnormal loads. In addition, vehicles traveling from the Port would experience major traffic delays in the metro throughout the day.

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 and piling 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: 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: 4.3 m measured from the ground. Possible height of load – 2.7 m.
- Weight: Gross vehicle mass of 56 t resulting in a payload of approximately 30 t
- Axle unit limitations: 18 t for dual and 24 t for triple-axle units
- Axle load limitation: 7.7 t on the front axle and 9 t 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 Bulskop PV facility will be located approximately 12 km south-east of the town of Beaufort West, as shown in **Figure 3-1**. The proposed site is bounded by the R61 to the west and an access to the site is proposed off this road. The R61 is a surfaced two-lane single carriageway and provides a link between Beaufort West, Aberdeen and Graaf Reinet.

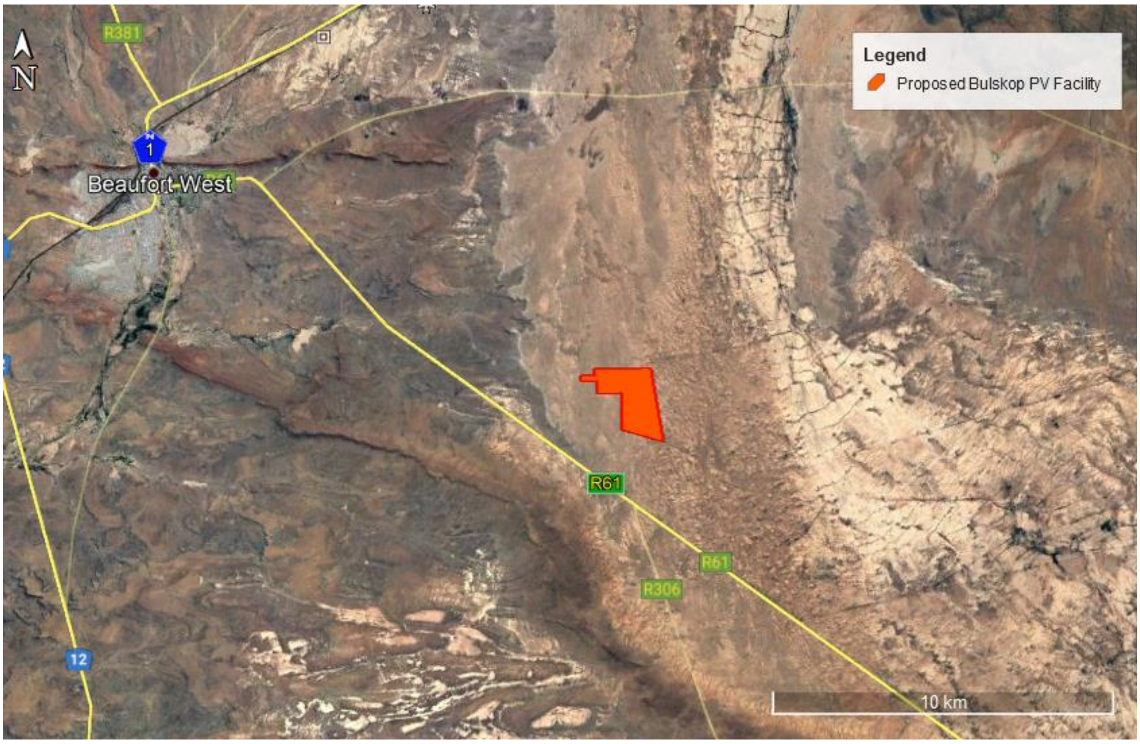

Figure 3-1: Aerial View of the Proposed Bulskop PV Facility

The proposed technology will comprise solar photovoltaic (PV) technology (monofacial or bifacial) with fixed, single or double axis tracking mounting structures, as well as the following associated infrastructure:

- Laydown area;
- Access and Internal road network;
- Auxiliary buildings (33 kV switch room, gatehouse and security, control centre, office, warehouse, canteen & visitors centre, staff lockers etc.);
- Facility substation;
- Inverter-station, transformers and internal electrical reticulation (underground cabling);
- Battery Energy Storage System (BESS);
- Rainwater Tanks; and
- Perimeter fencing and security infrastructure.

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. A third option, the Port of Cape Town, could be considered for smaller components.

The Port of Ngqura is located approximately 395 km travel distance from the proposed site whilst the Port of Saldanha is located approximately 555 km 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 starts at the Port and follows the R334 to the R75. Vehicle will take the R75 north-west to Wolwefontein, passing Kirkwood and Kleinpoort. Vehicles will continue on the R338 to Aberdeen, where vehicles will access the R61 which leads to the access point of 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 via the R61.

The alternative route from the Port of Cape Town, shown in blue in **Figure 3-2**, will follow the N1 pass Worcester and Laingsburg to Beaufort West. Vehicles will then take the R61 to the proposed site.

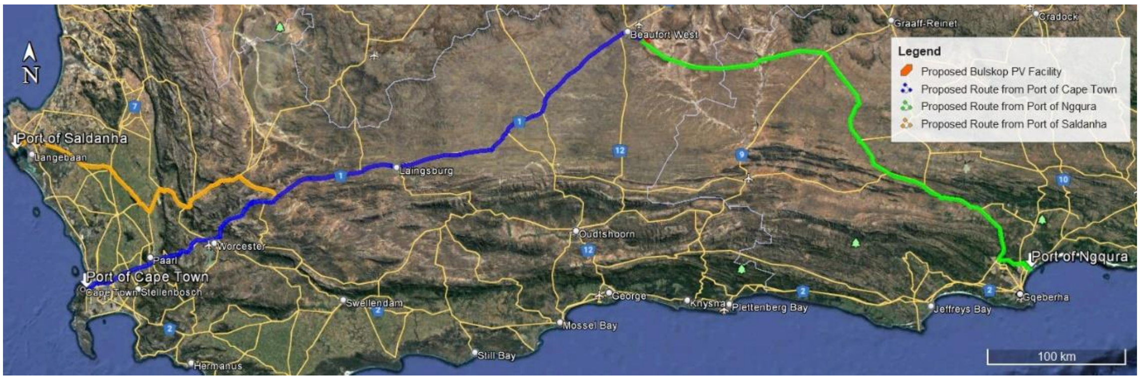

Figure 3-2: Preferred and Alternative Routes

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 the South African National Roads Agency (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 the 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 475 km.

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 945 km 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 **Figure 3-5**. Haulage vehicles will mainly travel on national and provincial roads and the total distance to the proposed site is approximately 1 185 km.

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 and access point to the Proposed Development

The proposed main access road to the site will be located off the R61, as shown in **Figure 3-6**. The proposed access road will be up to 10 m wide and approximately 5 km long main gravel/hard surfaced access road and will be constructed to provide direct access to the Bulskop PV facility. The road will be surfaced if necessary.

A network of gravel internal access roads, each with a width of up to ± 5 m, will be constructed to provide access to the various components of the Bulskop PV development.

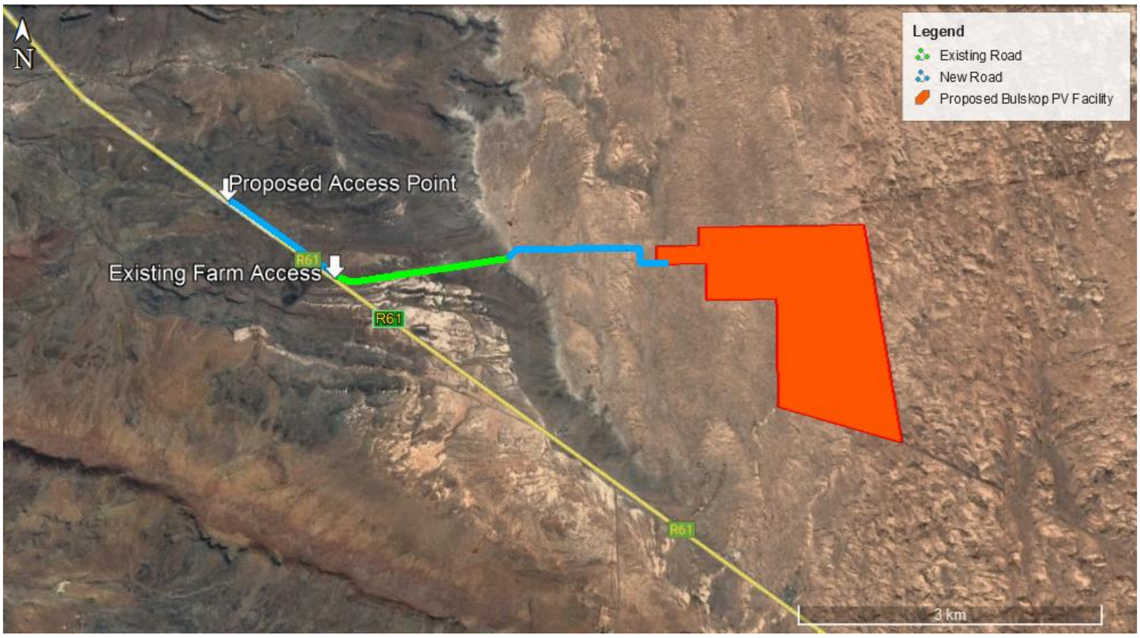

Figure 3-6: Proposed Access Road and Proposed Access Point

The main site access point (Latitude: 32°23'57.47"S, Longitude: 22°40'15.36"E) to the proposed facility will be via a new proposed access point located off the R61, as indicated in **Figure 3-6**. The existing farm access (Latitude: 32°24'22.26"S, Longitude: 22°40'55.91"E), shown in **Figure 3-7**, is not a feasible access option due to the inadequate sight distance on the Beaufort West side (south-west) of R61. The proposed access point will be located approximately 1.3 km from the existing farm access where sight lines are deemed adequate.

Figure 3-7: Existing farm access

The proposed access point will need to be upgraded to cater for the construction and abnormal load vehicles. Generally, the road width at the access point needs to be a minimum of 8m and the access roads on site a minimum of 4.5m (preferably 5m). The radius at the access point needs to be large enough to allow for all construction vehicles to turn safely. It is recommended that the access point be surfaced and the internal access roads on site remain gravel.

The type of access control will determine the required stacking distance. The stacking distance is measured between the access boom and the kerb/road edge of the external road. For example, for a boom-controlled access, this boom will need to be moved sufficiently into the site to allow for at least one abnormal vehicle to stack in front of the boom without impeding on external traffic. It is recommended that the site access be controlled via a boom and gatehouse. It is also recommended that security staff be stationed on site at the access booms during construction. A minimum stacking distance of 25m should be provided between the road edge of the external road and the boom.

Any geometric design constraints should be taken into consideration by the geometric designer. The internal roads need to be designed with smooth, relatively flat gradients (recommended to be no more than 8%) to allow an abnormal load vehicle to ascend to the respective turbine locations. It should be noted that turning radii of all roads must conform to 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 Beaufort West, Aberdeen and Graaf Reinet. It is envisaged that most materials, water, plant, services and people will be procured within a 50 km radius of the proposed facility. The nearest major town, Beaufort West, is located approximately 140 km 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 100 km 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 50 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 7 MW installation is estimated to range between 200 and 300 trips depending on the site conditions and requirements. For the 120 MW, the total trips can therefore be estimated to be between 3 429 and 5 143 heavy vehicle trips, which will generally be made over a 12-month construction period. Choosing the worst-case scenario of 5 143 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 20. In a rural environment, traffic during the peak hour accounts for roughly 20-40% of the average daily traffic i.e., 20-40% of the daily 20 vehicle trips generated by the facility will travel during the peak hour. This amounts to between 4 and 8 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 2 MW packages and 40 ft 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	20
Construction trips	150
Total	**206**

The impact on general traffic on the R61 is therefore deemed nominal as the 206 trips will be distributed across a 9 hr 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 Trip Generation – Operational Phase

During operation, it is assumed that approximately 50 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.

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
- Assuming that 200 000 solar panels are used, this would amount to approximately 200 vehicle trips
- Panels will be cleaned four times a year.

It is expected that these trips will not have a significant impact on external traffic. However, to limit the impact, it is recommended to schedule these trips outside of peak traffic periods. Additionally, the provision of rainwater tanks on site would decrease the number of trips.

6.1.5 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 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 5.1 m) 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.

6.1.6 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.

7 NO-GO ALTERNATIVE

The no-go alternative implies that the proposed Bulskop 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 A**.

Table 7-1: Impact Rating - Construction Phase – Traffic Congestion

IMPACT TABLE – CONSTRUCTION PHASE		
Environmental Parameter	*Traffic Congestion*	
Issue/Impact/Environmental Effect/Nature	*Transport of equipment, material and staff to site will lead to congestion.*	
Reversibility	*Completely reversible*	
Irreplaceable loss of resources	*No loss*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	Local (2)	Local (1)
Probability	Highly probable (4)	Improbable (2)
Duration	Very Short (1)	Very Short (1)
Magnitude	Moderate (6)	Low (4)
Significance rating	Medium (36)	Low (12)
Mitigation measures	• *Stagger component delivery to site* • *Reduce the construction period* • *The use of mobile batch plants and quarries in close proximity to the site* • *Staff and general trips should occur outside of peak traffic periods.* • *Regular maintenance of gravel roads by the Contractor during the construction phase and by Client/Facility Manager during operation phase.*	
Residual Risks:	• *None. Traffic will return to normal levels after construction is completed.*	

Table 7-2: Impact Rating - Construction Phase – Dust Pollution

IMPACT TABLE – CONSTRUCTION PHASE		
Environmental Parameter	*Air quality will be affected by dust pollution*	
Issue/Impact/Environmental Effect/Nature	*Traffic on roads will generate dust.*	
Reversibility	*Completely reversible*	
Irreplaceable loss of resources	*No loss*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	Local (2)	Local (1)
Probability	Highly probable (4)	Improbable (2)
Duration	Very Short (1)	Very Short (1)
Magnitude	Moderate (5)	Minor (2)
Significance rating	Medium (32)	Low (8)
Mitigation measures	• *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 Client/Facility Manager during operation phase.*	
Residual Risks:	• *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 7-3: Impact Rating - Construction Phase – Noise Pollution

IMPACT TABLE – CONSTRUCTION PHASE		
Environmental Parameter	*Noise pollution due to increased traffic.*	
Issue/Impact/Environmental Effect/Nature	*Traffic on roads will generate noise.*	
Reversibility	*Completely reversible*	
Irreplaceable loss of resources	*No loss*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	Local (2)	Local (1)
Probability	Highly probable (4)	Improbable (2)
Duration	Very Short (1)	Very Short (1)
Magnitude	Moderate (5)	Minor (2)
Significance rating	Medium (32)	Low (8)
Mitigation measures	• *Stagger component delivery to site* • *Reduce the construction period as far as possible* • *The use of mobile batch plants and quarries in close proximity to the site* • *Staff and general trips should occur outside of peak traffic periods*	
Residual Risks:	• *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.*	

Table 7-4: Impact Rating - Operation Phase

IMPACT TABLE – OPERATION PHASE
The traffic generated during this phase will be negligible and will not have any impact on the surrounding road network.

Table 7-5: Impact Rating - Decommissioning Phase

IMPACT TABLE – OPERATION PHASE
This phase will have the same 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 proposed and authorized renewable energy projects within 50 km 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. 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 7-6: Cumulative Impact

Nature: *Traffic generated by the proposed development and the associated noise and dust pollution.*		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Low (2)	Moderate (3)
Duration	Very Short (1)	Short (2)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly probable (4)	Definite (5)
Significance	**Medium (36)**	**Medium (55)**
Status (positive/negative)	Negative	Negative
Reversibility	High	High
Loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes
Confidence in findings: High.		
Mitigation: • *Stagger component delivery to site* • *Dust suppression* • *Reduce the construction period* • *The use of mobile batch plants and quarries in close proximity to the site* • *Staff and general trips should occur outside of peak traffic periods*		

10 ENVIRONMENTAL MANAGEMENT PROGRAM INPUTS

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 Operation phase due to the negligible traffic volume generated during this phase.

Table 7-7: EMPr Input – Construction Phase

Impact	**Mitigation/Management Objectives**	**Mitigation/Management Actions**	**Monitoring**		
			Methodology	***Frequency***	***Responsibility***
A. CONSTRUCTION PHASE					
A.1. TRAFFIC IMPACTS					
Dust and noise pollution Transportation of material, components, equipment and staff to site.	Minimize impacts on road network.	▪ Stagger component delivery to site. ▪ The use of mobile batch plants and quarries near the site would decrease the impact on the surrounding road network. ▪ Dust suppression ▪ Reduce the construction period as far as possible. ▪ Maintenance of gravel roads.	▪ Regular monitoring of road surface quality. ▪ Apply for required permits prior to commencement of construction.	▪ Before construction commences and regularly during construction phase.	▪ Holder of the EA.

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		▪ Apply for abnormal load permits prior to commencement of delivery via abnormal loads. ▪ Assess the preferred route and undertake a 'dry run' to test. ▪ Staff and general trips should occur outside of peak traffic periods as far as possible. ▪ 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.			

11 CONCLUSION AND RECOMMENDATIONS

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 Bulskop 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 50 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 5.1 m) e.g., Eskom and Telkom lines, along the proposed routes will have to be moved to accommodate the abnormal load vehicles.

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 farm, when operational, does not add any significant traffic to the road network.

Both the proposed access point and the access road to the facility are deemed feasible from a traffic engineering perspective.

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 proposed Bulskop 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