Traffic Engineering & Transport Planning
STURGEON CONSULTING

TRAFFIC IMPACT ASSESSMENT

FOR THE PROPOSED DEVELOPMENT OF A 300MW SOLAR PV FACILITY AND ASSOCIATED INFRASTRUCTURE (PHASE 2) ON SEVERAL PORTIONS OF FARMS IN THE HANOVER DISTRICT, NORTHERN CAPE

Project No.: STUR0352

FINAL REPORT
OCTOBER 2022

PREPARED BY:

STURGEON CONSULTING (PTY) LTD
7 Waterberg Crescent
Clara Anna Fontein
Durbanville
7550

CONTACT PERSON:

Annebet Krige
Tel no: +27 (84) 610 0233

PREPARED FOR:

ECOLEGES ENVIRONMENTAL CONSULTANTS
PO Box 516
Machadodorp
1170

CONTACT PERSON:

Mr Justin Bowers
Tel no: +27 (82) 451 5608

DOCUMENT CONTROL SHEET

<table>
<tr><th>DATE</th><th>REPORT STATUS</th><th>AUTHORED BY:</th><th>APPROVED BY:</th></tr>
<tr><td rowspan="2">August 2022</td><td rowspan="2">Draft for comment</td><td>NAME
Lize Neethling</td><td>NAME
Annebet Krige, Pr. Eng</td></tr>
<tr><td>SIGNATURE
  </td><td>SIGNATURE
  </td></tr>
<tr><td rowspan="2">October 2022</td><td rowspan="2">Final</td><td>NAME
Lize Neethling</td><td>NAME
Annebet Krige, Pr. Eng</td></tr>
<tr><td>SIGNATURE
  </td><td>SIGNATURE
  </td></tr>
<tr><td colspan="4">TITLE:
TRAFFIC IMPACT ASSESSMENT FOR THE PROPOSED DEVELOPMENT OF A 300MW SOLAR PV FACILITY (PHASE 2) ON SEVERAL PORTIONS OF FARMS IN THE HANOVER DISTRICT, NORTHERN CAPE.</td></tr>
<tr><td colspan="2">CARRIED OUT BY:
Sturgeon Consulting
7 Waterberg Crescent
Clara Anna Fontein
Durbanville
7550

Mrs Annebet Krige

Tel: +27 84 610 0233
Email: annebet@sturgeonsa.co.za</td><td colspan="2">COMMISSIONED BY:
Ecoleges Consultants
PO Box 516
Machadodorp
1170

Mr Justin Bowers

Tel: +27 82 451 5608
Email: justin@ecoleges.co.za</td></tr>
<tr><td colspan="4">SYNOPSIS:
This report assesses the key transportation issues pertaining to the proposed development of a 300MW Solar PV facility (Phase 2) and associated infrastructure on several portions of farms in the Hanover District in the Northern Cape Province.</td></tr>
</table>

DECLARATION OF INDEPENDENCE

This report was compiled by Mrs Annebet Krige and Mrs Lize Neethling of Sturgeon Consulting, both who hereby declare that they acted as independent consultants and have no business, financial, personal or other interest in the proposed development project, application or appeal in respect of which we were appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of our performing such work. The CV of the lead author that performed the core duties are contained in Annexure A.

Annebet Krige, Pr Eng

Lize Neethling, B Eng

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS

TIA – Traffic Impact Assessment
TIS – Traffic Impact Statement
vph – Vehicles per hour
vpd – Vehicles per day
COTO – Committee of Transport Officials
AMP – Access Management Plan
RCAM - Road Classification and Access Management Manual
LOS – Level of Service
AM – Morning
PM – Afternoon
EIA – Environmental Impact Assessment
BAR – Basic Assessment Report

PV – Photovoltaic
MW – Megawatt
REDZ – Renewable Energy Development Zone
SEF – Solar Energy Facility

1. INTRODUCTION

1.1 APPOINTMENT AND BACKGROUND

Sturgeon Consulting (Pty) Ltd was appointed by Ecoleges Environmental Consultants on behalf of Soventix South Africa (Pty) Ltd to conduct a Traffic Impact Assessment (TIA) for the proposed construction of a 300MW Solar Photovoltaic (PV) facility and associated infrastructure on several portions of farms in the Hanover District, Emthanjeni Local Municipality, Northern Cape Province.

The 300MW Solar PV facility will be Phase 2 of the entire solar development on the subject property. The first phase of the project included an application for a 225MW solar PV facility for which environmental authorisation was obtained in April 2018. An additional application will also be made for Phase 3 of the solar development, which will include a 400 MW Solar Photovoltaic (PV) facility on the Remainder of Farm Goede Hoop 26C and Portion 3 of Farm Goede Hoop 26C. A separate TIA will be submitted for this project.

1.2 LOCALITY

The site is located to the north-east of the N10, approximately 28km north-west from Hanover and 35km south-east from De Aar. The farm portions that will be affected by the proposed application is shown in **Table 1**.

Table 1: Affected Farm Portions

No	Farm Name	Farm/ Erf No	Portion	Property Type
1	GOEDE HOOP	26	0	Farm
2	KWANSELAARS HOEK	40	0	Farm
3	LEUWE FOUNTAIN	27	0	Farm
4	RIET FOUNTAIN	39	0	Farm
5	KWANSELAARS HOEK	40	0	Farm Portion
6	GOEDE HOOP	26	0	Farm Portion
7	GOEDE HOOP	26	3	Farm Portion
8	LEUWE FOUNTAIN	27	6	Farm Portion
9	LEUWE FOUNTAIN	27	0	Farm Portion
10	RIET FOUNTAIN	39	2	Farm Portion
11	KWANSELAARS HOEK	40	2	Farm Portion
12	RIET FOUNTAIN	39	0	Farm Portion

Please refer to **Figure 1** for the Locality Plan.

Figure 1: Locality Plan

The footprint of the proposed Phase 2 of the development in relation to the approved Phase 1 and extent of the affected farm portions is shown in **Figure 2** below.

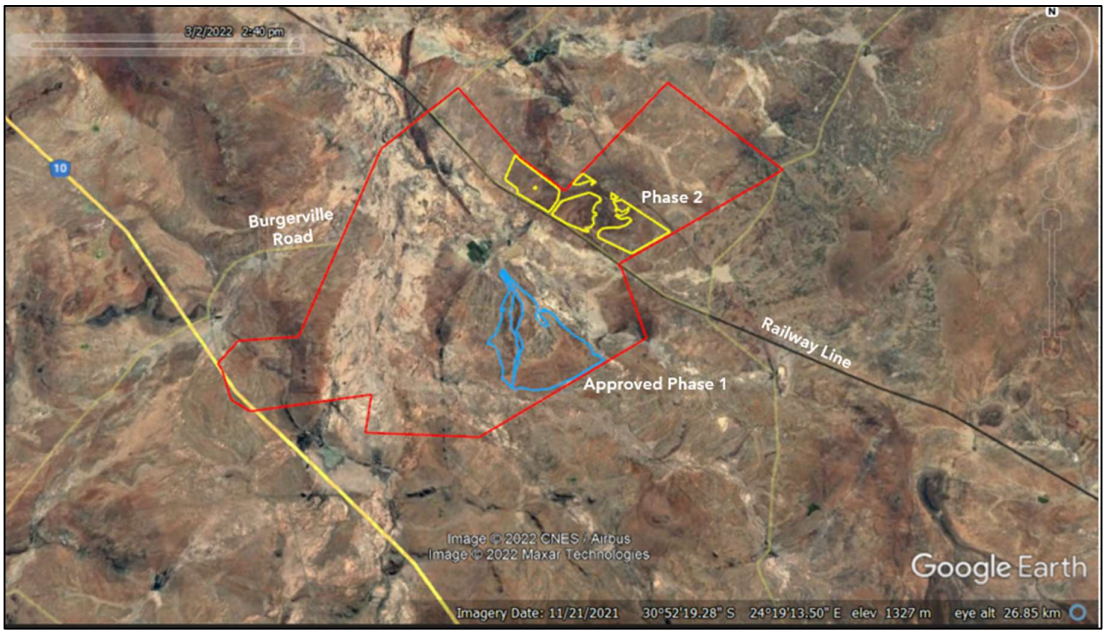

Figure 2: Phase 2 Footprint

1.3 SCOPE OF WORKS

This TIA will investigate the transportation implications associated with the abnormal load vehicles transporting components to the site and the transportation of

construction materials, equipment and workers to the site during the construction, operational and decommissioning phases.

1.4 METHODOLOGY

The broad methodology adopted for this specialist study is as follows:

- Site visit – 24 March 2022
- Literature review and internet research
- Traffic data collection (Traffic volumes along the N10 provided by SANRAL)
- Data analysis
- Evaluation of initial proposed access configurations
- Liaison with client and/or project team
- Fine tune analysis
- Preparation of report and figures

1.5 LEGISLATION WITH REGARDS TO TRAFFIC STUDIES

A TIA is required to determine what impact a new development's traffic will have on the existing road network and whether or not this development can be accommodated by the existing transport system. The purpose of a TIA is to support sustainable development by protecting the overall integrity of the transport system for the benefit of all users.

The *South African Committee of Transport Officials (COTO), TMH16 Manual, Volume 1*, states that in terms of the manual, a TIA must be undertaken when "An application is submitted for a change in land use, and the highest total of additional hourly vehicular trip generation (including pass-by and diverted trips) as a result of the application exceeds 50 trips per hour".

From the *TMH16*, the Constitution of the Republic of South Africa empowers a Municipality to govern, on its own initiative, the local government affairs of its community, subject to national and provincial legislation. According to the constitution, the Municipality has executive authority in respect of, and has the right to administer, inter alia, the local government matters listed in Part B of Schedule 4 and Part B of Schedule 5, which includes municipal roads. The Municipality also has the right to exercise any power concerning a matter reasonably necessary for, or incidental to, the effective performance of its functions.

In terms of Section 152(1) of the Constitution, the objects of local government include, inter alia, to ensure provision of services to communities in a sustainable manner and to promote social and economic development. Section 153 emphasises that in its budgeting and planning processes, the Municipality must give priority to the basic needs of the community and to promote social and economic development of the community.

Municipal development planning in South Africa is regulated by the *Municipal Systems Act (Act No 32 of 2000)*. This act requires the preparation and adoption of Integrated Development Plans (IDPs) to guide and regulate all planning and development in the Municipality. The *National Land Transport Act NLTA (Act No 5 of 2009)* requires the integration of land transport planning with the land development process and the preparation of integrated transport plans which constitutes the transport component of the integrated development plans of municipalities. These integrated transport plans include the regulation and provision of transport infrastructure for all modes of transport. According to the National Land Transport Act, property developments within a transport area are subject to traffic impact and transport assessments.

The *National Land Transport Act 5 of 2009 (NLTA) Section 38* does not set out any regulation as to what is required in a TIA. However, Section 38(2b) of the act states that "developments on property within the area of the planning authority are subject to traffic impact assessments and public transport assessments as prescribed by Minister."

The *National Road Traffic Act 93 of 1996 (NRTA)* provides for road traffic matters to be applied uniformly throughout the Republic and for matters connected therewith.

1.6 STUDY PURPOSE

The primary purpose of this report is to evaluate the expected traffic impact of the proposed Solar Photovoltaic (PV) facility and associated electrical grid infrastructure with the main focus on access and traffic distribution during the Construction, Operational and Decommissioning phases of the project. In other words, the objective of the TIA is to assess the impact of the activities of the proposed PV facility on the existing external road network surrounding the development during these phases. The report identifies the preferred access route to the site, comments on the condition of the existing roads in the vicinity of the site, identifies possible access points to the site and recommends road improvements to minimise the impact on the surrounding road network where necessary.

This TIA addresses the following traffic and transportation related implications of the proposed PV facility:

- Locality of the site for the proposed PV facility;
- Existing traffic volumes on N10;
- Acceptability from a traffic safety point of view of the location of the access route to the proposed facility;
- Risk posed by construction and operational vehicles; and
- Based on existing volumes of traffic, recommendations for mitigations measures for traffic impacts where relevant.

In terms of limitation of this TIA, it should be noted that this report does not address the internal traffic circulation for the PV facility.

The TIA will be developed in line with the guidelines of the *Manual of Traffic Impact Studies (RR93/635)* published by the Department of Transport in 1995 and *TMH16 Volume 1 & Volume 2, South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual, October 2020* published by the Committee of Transport Officials (COTO).

1.7 APPROVED PROPOSED DEVELOPMENT IN THE STUDY AREA

The Department of Forestry, Fisheries and the Environment has requested that all applications for other solar PV facilities in the vicinity of the site be included along with all existing built developments. The following applications and developments are located within a 30km radius from the proposed solar PV facility and are listed on the Renewable Energy (RE) Environmental Impact Assessment Application Map that was produced in collaboration between the National Department of Environmental Affairs (DEA), the Council for Scientific and Industrial Research (CSIR) and the Centre of Renewable and Sustainable Energy Studies (CRSES). Refer to **Table 2** and **Figure 3** for the identified facilities that will be included.

Table 2: Proposed and Approved Solar and Wind Facilities in the Vicinity of the Subject Property

Map Number	DFFE Reference	Project Name	Type of Facility	Size
1	14/12/16/3/3/2/311	Proposed Oasis wind energy facility project located near De Aar, Northern Cape	BES	-
2	12/12/20/2463/1/AM4	The Wind Energy Facility (North and South) Situated On The Plateau Near De Aar, Northern Cape Province	WEF	258MW
3	14/12/16/3/3/2/278	Proposed Castle wind energy facility project, located near De Aar, Northern Cape	WEF	140MW
4	14/12/16/3/3/2/280	Proposed Zingesele wind energy fcaility project, located near De Aar, Northern Cape	WEF	-
5	14/12/16/3/3/2/744	Proposed PV facility on farm Jakhalsfontein near De Aar	SF	-
6	14/12/16/3/3/2/741	Proposed PV facility on farm Caroluspoort near De Aar	SF	300MW
7	12/12/20/1651/A2	Proposed establishment of a wind power generating facility near De Aar, Northern Cape.	WEF	100,5MW
8	14/12/16/3/3/2/483/AM1	Proposed Badenhorst Dam solar PV3 plant near De Aar, Emathanjeni Local Municipality, Northren Cape	SF	75MW
9	14/12/16/3/3/2/382/7	Proposed Solar Power Generation Facility in the remaining extent of the farm Vetlaagte 4, De Aar, Northern Cape Province	SF	75MW
10	12/12/20/2250	The Proposed Construction Of A Solar Energy Facility in The Emthanjeni Local Municipality In The Northern Cape Province	SF	-
11	14/12/16/3/3/2/640	The Proposed Establishment of an 86mw Photovoltaic Solar Facility on Portion 4 of The Farm Rooilyf No. 389, Registration Division, Zf Mcgawu Local Municipality, in the Northern Cape Province	SF	86MW

Map Number	DFFE Reference	Project Name	Type of Facility	Size
12	12/12/20/2497	Proposed Construction Of The Inyanga Energy Project 2, Farm Riet Fountain No 6, De Aar, Northern Cape	SF	75MW
13	12/12/20/2258/4	The Proposed Establishment Of Photovoltaic (Solar Power) Farms In The Northern Cape Province	SF	100MW
14a	?	Proposed Development of a Solar PV Facility on several portions of farms in the Hanover District. Phase 1	SF	225MW
14b*	**In Process**	**Proposed Development of a Solar PV Facility on several portions of farms in the Hanover District. Phase 2**	**SF**	**300MW**
14c	In Process	Proposed Development of a Solar PV Facility on several portions of farms in the Hanover District. Phase 3	SF	400MW

* Study Facility for this Traffic Impact Assessment

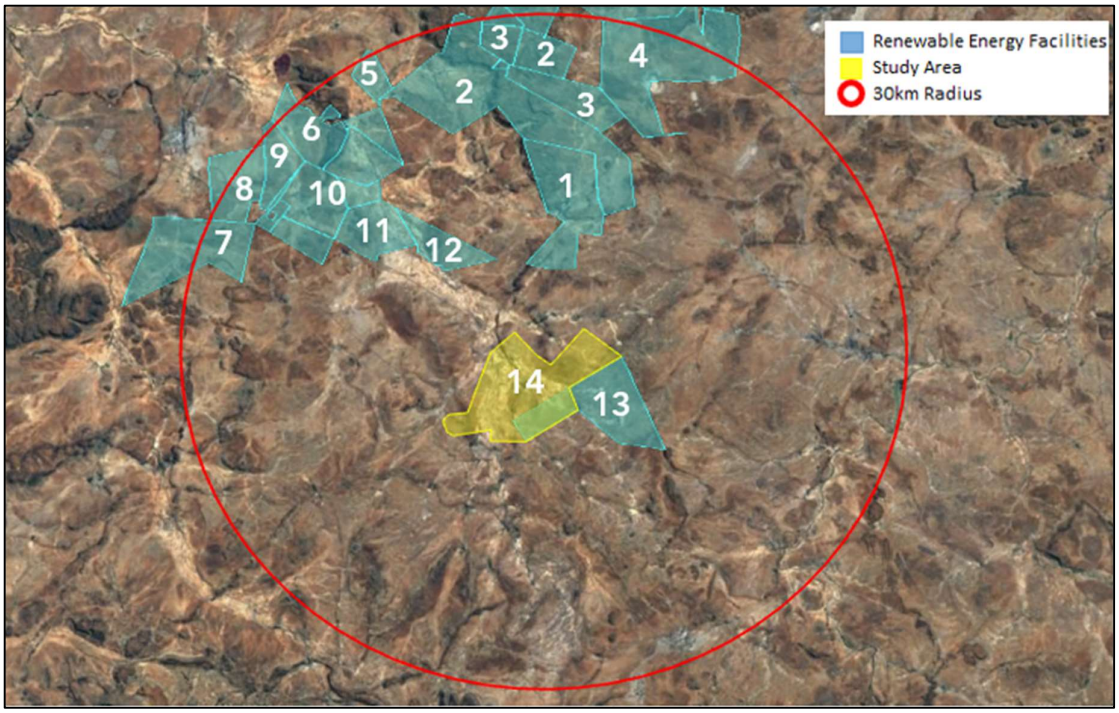

Figure 3: Proposed and Approved Solar and Wind Facilities in the Vicinity of the Subject Property

2. PROJECT DESCRIPTION

2.1 PROJECT PHASING

The project can be divided into the following three main phases:

- Construction Phase;
- Operational Phase; and
- Decommissioning Phase.

2.1.1 Construction Phase

It is anticipated that construction of the 300MW solar PV facility will take place in sub-phases of 100MW each. Construction of each 100MW facility typically takes between 12 – 15 months to be completed. The construction phase for the proposed 300MW solar PV facility is therefore expected to be approximately 36 to 45 months.

The main activities that will form part of the construction phase are:

- Removal of vegetation for the proposed infrastructure;
- Excavations for solar panel infrastructure and associated infrastructure;
- Establishment of a laydown area for equipment;
- Stockpiling of topsoil and cleared vegetation;
- Creation of employment opportunities and associated transport of employees to and from site;
- Transportation of material and equipment to site, and personnel to and from site;
- Construction of the solar field, 132kV power line and electrical distribution infrastructure including in-field transformers, 132kV switching sub-station (Dx) and a connecting overhead 132kV distribution powerline from Phase 2 to the Phase 1 400kV Main Transmission Sub-station (MTS); and
- Maintenance and dust suppression of access roads servicing the project site.

Furthermore, it is expected that the construction equipment will include at least:

- Water tankers;
- Graders;
- Tipper trucks;
- Drilling rigs (down to 2m);
- Mobile pile ramming machines (down to 3m at the most). Each pile is 4 to 9m apart;
- Rock crushing plant;
- Excavators;
- TLBs;
- Concrete mixers;
- Compaction equipment;
- Light delivery vehicles; and
- Heavy delivery vehicles (for the transformers).

2.1.2 Operational Phase

The following activities will occur during the operational phase:

- The generation of electricity from the proposed solar facility and distribution of electricity from the 132kV sub-station to the 1 400kV MTS;
- Cleaning of panels and maintenance of the solar field and infrastructure;
- Road maintenance that will focus on the suppression of dust on the access roads; and
- During the life span of the project (approximately 20 years), on-going cleaning and maintenance will be required on a scheduled basis.

2.1.3 Decommissioning Phase

The main aim of the decommissioning is to return the land to its original, pre-construction condition. Should the unlikely need for decommissioning arise (i.e. if the actual solar facility becomes outdated or the land needs to be used for other purposes), the decommissioning procedure will be undertaken and the site will be rehabilitated and returned to its pre-construction state.

2.2 TRANSPORTATION REQUIREMENTS

During the project cycle, it is anticipated that the following vehicles will need to access the site:

- Building materials are to be transported by single-unit trucks within the road freight limitations of South Africa.
- Solar panels, frames and inverters are to be transported in 40-foot containers (which have exterior dimensions of 12.19m long x 2.44m wide x 2.59m high) on double axle trucks within the road freight limitations of South Africa.
- Workers from the surrounding area will be transported by minibus taxi/shuttle/bus or private car.
- Transformers will be transported by abnormal load trucks for which a permit will need to be applied for in terms of Section 81 of the National Road Traffic Act and authorisation needs to be obtained from the relevant road authorities to modify the road reserve to accommodate turning movements at intersections.

3. EXISTING ROAD NETWORK

3.1 POSSIBLE ROUTE ALTERNATIVES

There are three options for the haulage of imported materials to the proposed PV facility as shown in the figures below. The preferred option will be the route from the Port of Ngqura as shown in **Figure 4**. The route is the shortest and fastest route to the site and is approximately 445km and follows the N2 from the Port and then turns north onto the N10 past Hanover and up to the access at Burgerville Road.

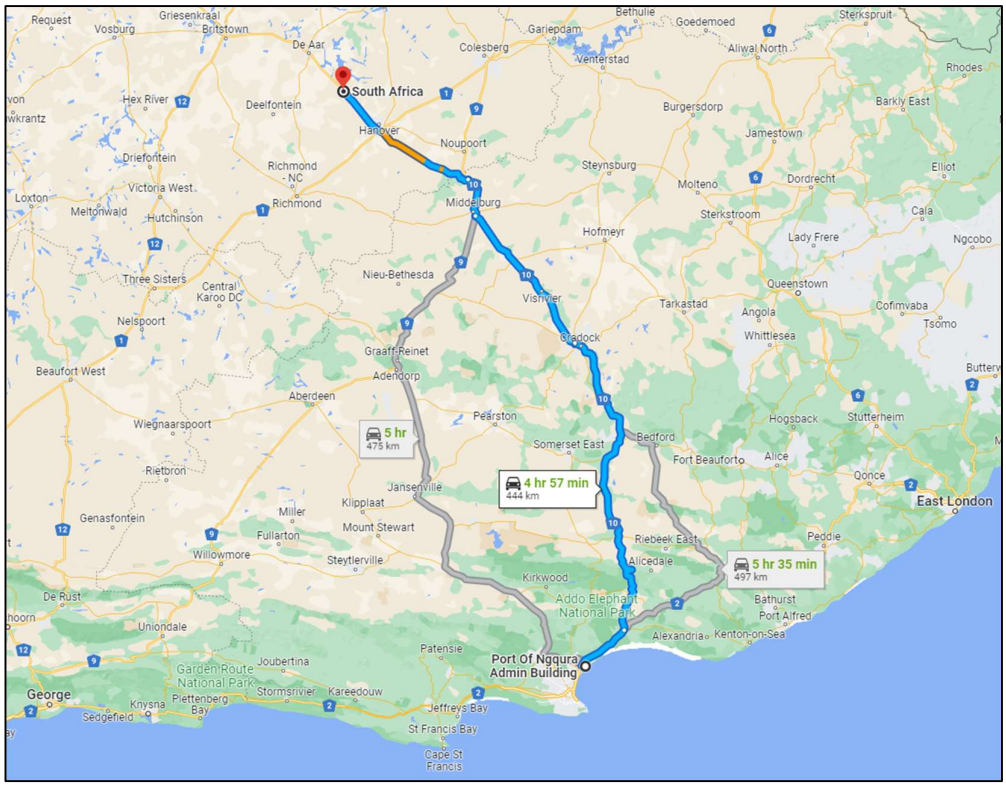

Figure 4: Preferred Route

The first alternative option will be the route from the Port of Cape Town as shown in **Figure 5**. This route is approximately 730km and follows the N1 from the Port and then turns north at Hanover onto the N10 up to the access at Burgerville Road.

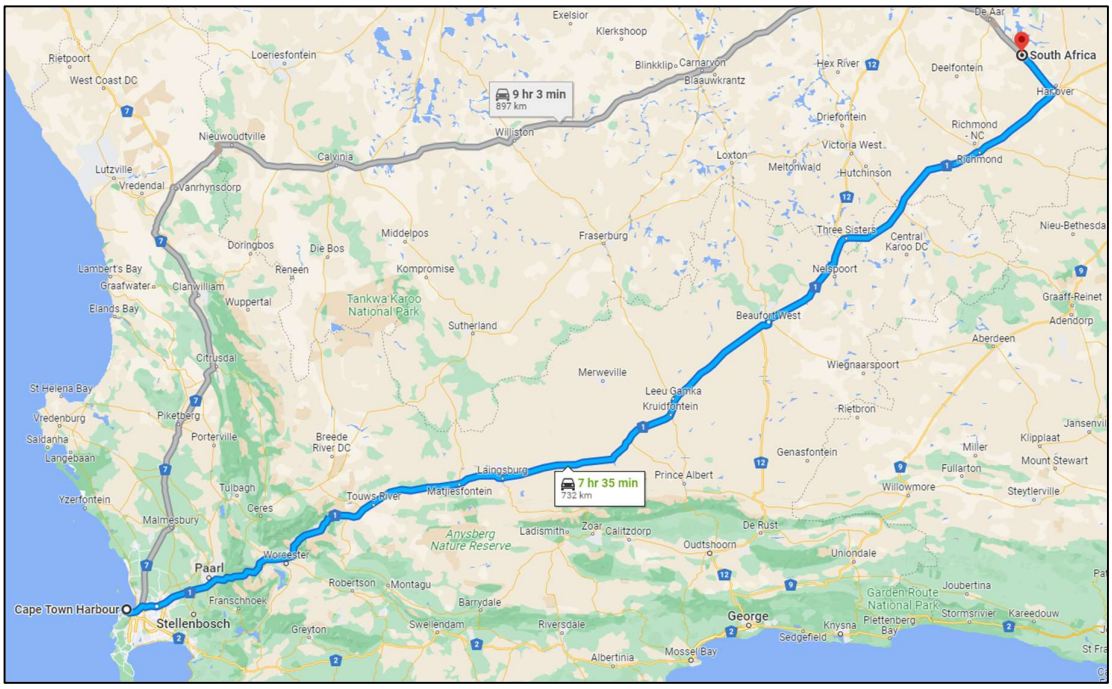

Figure 5: Alternative Route 1

The second alternative option will be the route from the Port of Saldanha as shown in **Figure 6**. This route is approximately 805km and follows the N7 from the Port and then turns east past Calvinia. At Britstown, the N10 will be followed, past De Aar up to the access at Burgerville Road.

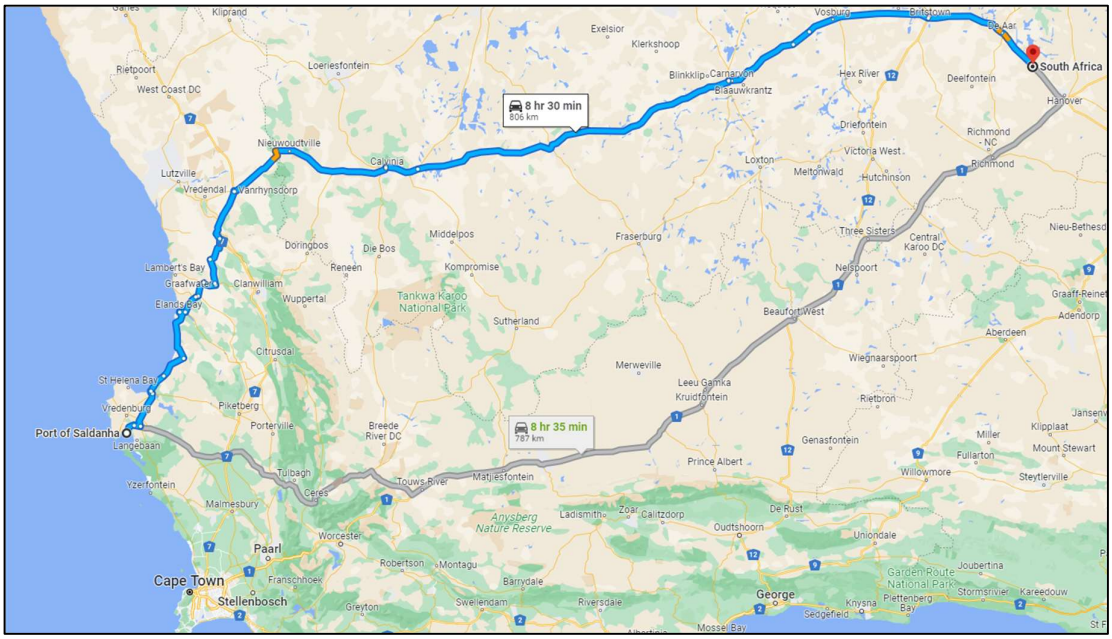

Figure 6: Alternative Route 2

3.2 ROAD NETWORK IN THE SITE VICINITY

The broader road network in the vicinity of the site is shown in **Figure 7** below.

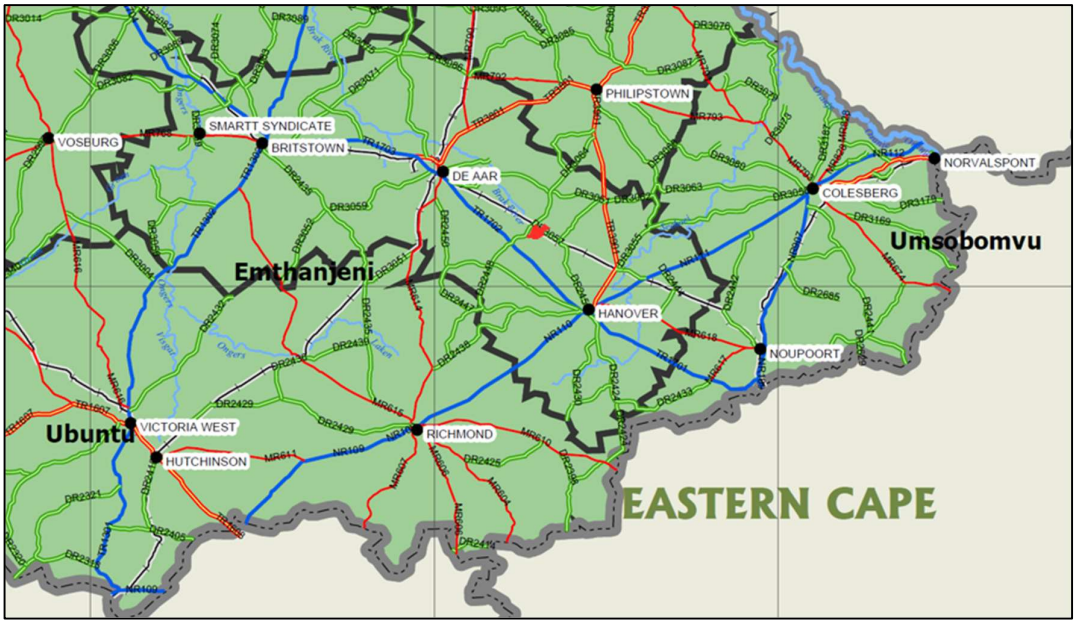

Figure 7: Road Network

3.2.1 National Road 10 (N10)

The N10 is a Class 1 rural principal arterial with an approximate width of 10.5m in the vicinity of the site. The N10 is a two-lane undivided road with one lane per direction and paved shoulders. The N10 is a national interprovincial road linking Gqeberha in the south with Hanover and De Aar in the north and runs all the way north-west, past Upington to the eastern Namibian border.

Figure 8: N10

3.2.2 District Road (Burgerville Road)

Burgerville Road is a gravel two-lane undivided road with one lane per direction and an approximate width of 7.1m. Burgerville Road runs parallel to the northwestern boundary of the property for approximately ±4.5km before crossing over the existing railway line, whereafter the road runs south-eastbound parallel to the railway line through the property.

Figure 9: Burgerville Gravel Road

3.2.3 Internal Roads

Internal roads between the solar photovoltaic modules will be along existing farm tracks where possible. If new roads are to be constructed, it will generally be stabilised gravel or informal tracks approximately 4m to 5m wide.

3.2.4 General Comments / Notes

Existing roads will be upgraded (graded 5 to 6 m wide, imported material, shaped for runoff, and compacted), including the servitude road under the Eskom 132 kV powerline. New roads will also be built (graded, imported material, shaped for runoff, and compacted) to access the construction camp, operational area, components of the PV system, such as the field transformers, on-site substation, and distribution line. Except for passing lanes, upgraded and new access roads will be 5 – 6 m wide and total an estimated ± 9,8 km and ± 11,3 km, respectively. Up to six (6) road crossings will be required to access the four different PV Blocks of the Solar PV facility, which is fragmented by the watercourse. Passing lanes up to ± 8 m wide and ± 30 m long will be placed at strategic areas on new roads.

3.3 ROAD CONDITION

Existing road infrastructure is well developed in the area and thus well connected to surrounding major centres via regional routes. The combination of national roads and first and second order roads provides good inter- and intra- regional accessibility. The South African National Roads Agency (SANRAL) is responsible for the maintenance of

the national roads which are in a good condition, however heavy traffic contribute significantly to the deterioration of the road surfaces.

During the site visit it was noted that the national roads maintained by SANRAL were in a good condition, while the gravel provincial roads in the vicinity of the site were in a fair to poor condition. Road freight, transport, specifically heavy vehicle transport, significantly contributed to the deterioration of the road surfaces and the maintenance of these roads are not always adequate.

4. SITE ACCESS CONSIDERATIONS

4.1 PRIMARY ACCESS LOCATION

The primary access to the proposed 300MW solar PV facility will be taken along the N10, from the existing Burgerville Road as shown in **Figure 10** below. This access will be the main access from the N10 that will be used during the construction phase, operational phase and decommissioning phase.

According to the *SolarAfrica Sun Central Access Road Study, September 2022* the bell mouth of the western Burgerville Road approach at the N10 / Burgerville Road intersection must be widened to allow for a suitable turning circle to be able to accommodate the delivery of the 500mVa transformer for Phase 1 and the 132kV sub-station transformer for Phase 2. A truck turning circle of 22m will be required to accommodate these deliveries.

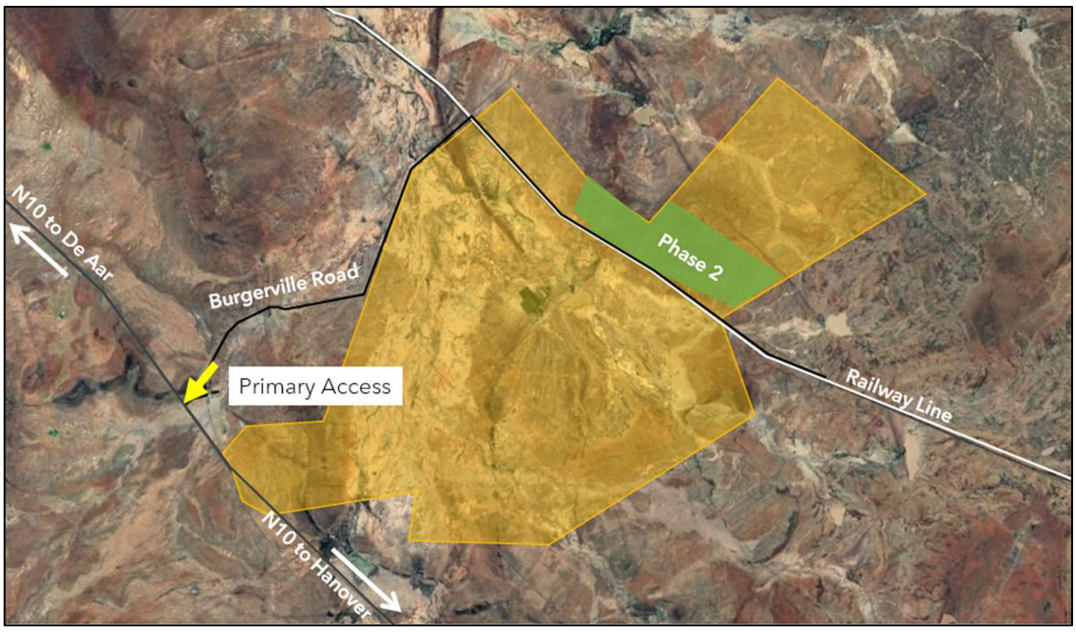

Figure 10: Primary Site Access Location

4.1.1 Shoulder Sight Distance (SSD)

According to the *TRH17 Geometric Design of Rural Roads, April 1988* for a design speed of 120km/h shoulder sight distances of 240m, 355m and 450m is required for a Passenger vehicle (P), a Single-Unit Truck (SU) and a Single-Unit Truck plus Trailer (SU+T), respectively. The site visit and photos taken at the existing access location indicated that shoulder sight distance to the left will be sufficient. Sight distance to the right was measured as approximately 320m which is sufficient for Passenger vehicles (P). To ensure the safe exit of Single-Unit Trucks (SU) and especially Single-Unit Truck plus Trailers (SU+T), it is proposed that appropriate traffic accommodation be placed on the eastern approach of the N10, indicating a construction access ahead with a

possible flagman to alert drivers and slow them down. Refer to **Figure 11**.

Sight Distance to the Left

Sight Distance to the Right

Figure 11: Shoulder Sight Distance (SSD) at Existing Access along N10

4.2 SECONDARY ACCESS LOCATION

Direct access to the proposed 300MW solar PV facility will be taken from the existing farm access to the property along the Transnet servitude road approximately 4.65km southeast of where the Burgerville Road crosses the railway line, as shown in **Figure 12** (Existing Access 1). This access will be utilised by passenger and small delivery vehicles. The in-field transformer and the 132kV sub-station transformer will be delivered in 20ft containers on flatbed trucks that may not fit under the Transnet electrical lines and must avoid going over the railway line. These trucks will access the property along Burgerville Road approximately 5.11km northeast of the N10 / Burgerville Road intersection, as shown in **Figure 12** (Existing Access 2).

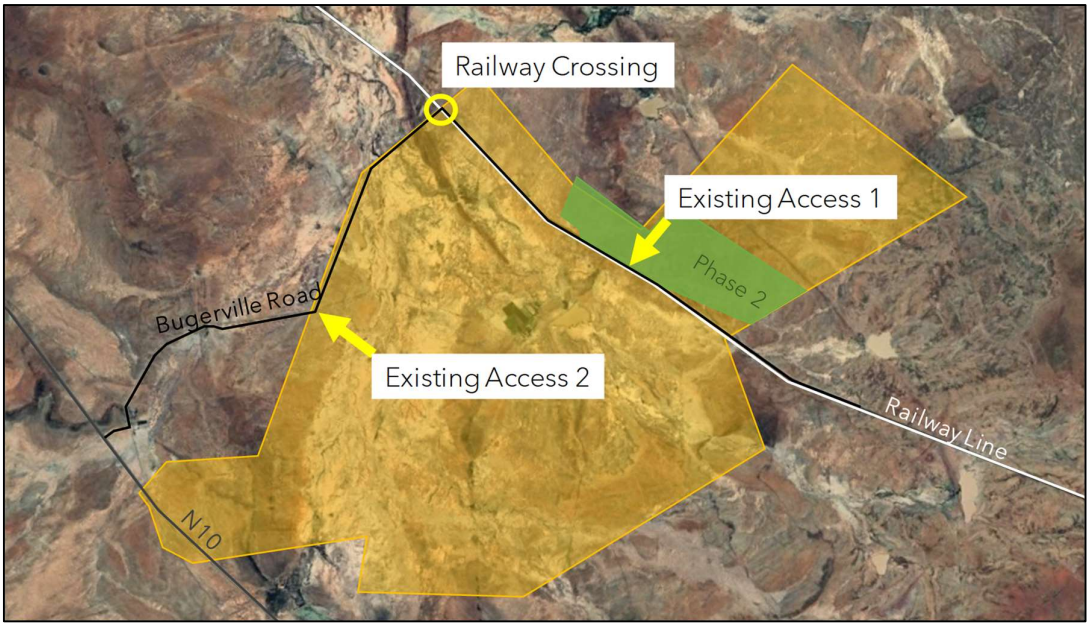

Figure 12: Site Access Location

4.2.1 Shoulder Sight Distance (SSD)

According to the *TRH17 Geometric Design of Rural Roads, April 1988* for a design speed of 80km/h, shoulder sight distances of 160m, 240m and 305m is required for a Passenger vehicle (P), a Single-Unit Truck (SU) and a Single-Unit Truck plus Trailer (SU+T), respectively.

The site visit and photos taken at the first access location indicated that shoulder sight distance will be sufficient and can be seen in **Figure 13**. The site visit and photos taken at the second access location indicated that shoulder sight distance will be sufficient and can be seen in **Figure 14**.

Sight Distance to the Left

Sight Distance to the Right

Figure 13: Shoulder Sight Distance (SSD) at the First Existing Access along Burgerville Road

Sight Distance to the Left

Sight Distance to the Right

Figure 14: Shoulder Sight Distance (SSD) at Second Existing Access along Burgerville Road

5. EXISTING TRAFFIC CONDITIONS

SANRAL has a permanent counting station (Station 1300) along the N10, approximately 14.6km north-west from Hanover and approximately 44.6km south-east from De Aar. The location of the counting station is indicated in **Figure 15** below. SANRAL provided the traffic count information for the above-mentioned count station along the N10.

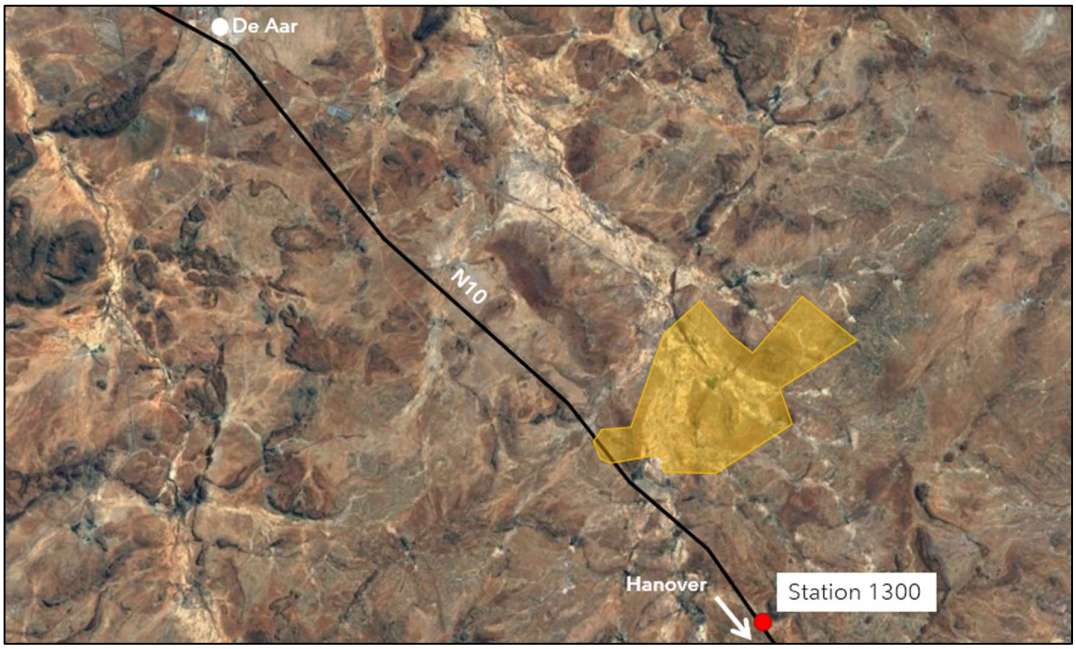

Figure 15: Location of Count Station

A summary of the Average Daily Traffic (ADT), Percentage Trucks and Highest volume on the road recorded yearly from 2007 (when the station was installed) is shown in **Table 3** and **Figure 16** below.

Table 3 Station 1300 Count Data

Year	Average Traffic (ADT) (two-way)	Percentage Trucks (two-way)	Highest daily volume on the road (two-way)
2007	435	14.4%	102
2008	430	15.4%	75
2009	441	14.3%	70
2010	470	14.6%	100
2011	522	18.4%	86
2012	468	12.7%	86
2013	530	18.6%	118
2014	524	15.9%	84
2015	532	14.2%	88
2016	571	14.7%	89
2017	566	14.7%	85
2018	561	14.9%	87
2019	584	16.1%	90

Year	Average Traffic (ADT) (two-way)	Percentage Trucks (two-way)	Highest daily volume on the road (two-way)
2020	600	29.4%	107
2021	790	36.0%	106
2022	1018	48.7%	186

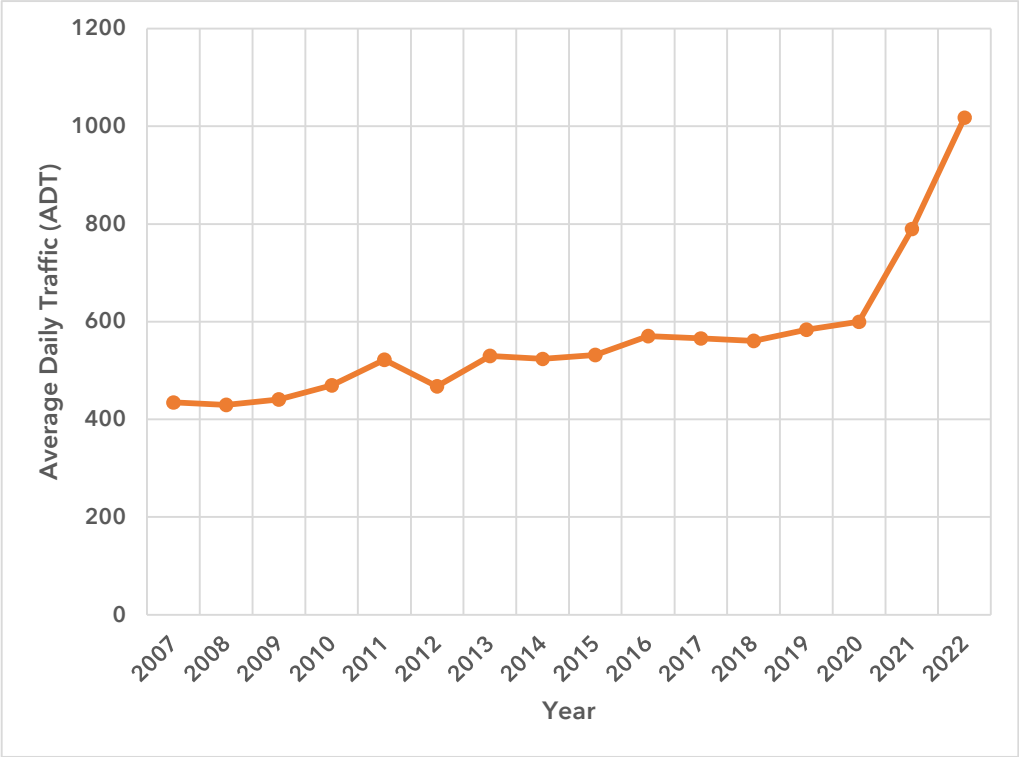

Figure 16: SANRAL Station 1300 Historic Count Information

From the above information, it can be concluded that the growth rate from the recorded 2007 to 2022 ADT values is approximately 6% per annum. A significant increase in ADT and heavy vehicle traffic is evident from 2020 onwards. This can possibly be attributed to increased mining activities and renewable energy projects. It should however be noted that the capacity of a Class 1 road is in the order of **2000 vehicles per hour** and therefore the traffic volumes recorded on this road is still significantly less than the capacity of the road.

6. TRIP GENERATION RATES

The trip generation rates discussed below are based on similar studies that have been undertaken for Solar Energy Facilities and the associated electrical infrastructure (collector substation and transmission line). The trip generation rates discussed below relates to the anticipated trip generation rates associated with the 300MW Solar PV Facility.

6.1 CONSTRUCTION PHASE

It is expected that the Construction Phase for each of the proposed PV Plants will be 36 months due to the magnitude of the proposed plant.

For each 100MW, the following number of truck trips (one-way) are expected:

- Panels = 273 truck trips
- Mounting Structure = 300 truck trips
- Inverters = 13 truck trips
- Field Transformers = 12 truck trips
- Cable and Battery Operating System (BOS) = 120 truck trips

It is assumed that each 100MW sub-phase of the project will be constructed over a 12-month period. Therefore, based on a 12-month construction period per sub-phase (i.e. 52 weeks), and a 6 day work week (52 x 6 = 312 work days), this could result in approximately **3 daily truck trips (one-way).** This number of daily trips could therefore be expected for the duration of the project, i.e. 48 months.

It is also expected that approximately 13 single unit trucks carrying construction materials will visit the site on a daily basis, resulting in **13 daily single unit truck trips (one-way).**

Furthermore, it is expected that 300 workers will be transported to the site daily. This number could increase to 650 workers for short periods during the peak construction phase. For the purposes of this study, an average of 300 workers per day was however used. The workers will be transported to/from the site by 15-seater minibus taxis from the surrounding areas resulting in approximately **20 daily staff minibus taxi trips (one-way).** Experience has shown that during the construction period, approximately **2 daily private vehicle trips** are expected to come to/from the site from supervisors or senior personnel. Therefore, a total of **22 daily staff trips (one-way)** are expected.

Water will also be required during the construction phase for the installation of the solar panels, dust control along the gravel roads and potable water. Only borehole water will be utilised. For the purposes of this study, an additional **1 daily water truck trip (one-way)** to be used for dust control along the gravel roads will be taken into account.

Based on the above, a total of **39 one-way trips per day, i.e. 78 trips in total per day (two-way)** are expected during the 36 month period construction phase.

6.2 OPERATIONAL PHASE

It is expected that the Operational Phase will take place during the life span of the project (approximately 20 years). During this time, it is anticipated that 1 - 2 light load trucks will visit the site on a daily basis. This will equate to **2 daily light load truck trips (one-way).**

It is expected that approximately 55 workers will be transported to the site daily by 15-seater minibus taxis from the surrounding areas, resulting in 4 daily staff trips. Furthermore, it was assumed that 2 daily private vehicle trips will be generated by supervisors or senior personally commuting to the site by private vehicles. Resulting in a total of **6 daily staff trips (one-way)**.

It is estimated that approximately 600 000 litres of water will be required for cleaning the solar panels, which must be done 4 times per year. This will relate to approximately 1 daily 12 kilolitre water truck trips ((600 000 x 4) / (52 weeks x 5 days)) for cleaning the solar panels. Furthermore, it is also anticipated that the gravel district road be watered daily to suppress dust during operation depending on traffic volumes. However, only borehole water will be utilised. For the purposes of this study, an additional **1 daily water truck trip (one-way)** to be used for dust control along the gravel roads will be taken into account.

Based on the above, a total of **9 one-way trips per day, i.e. 18 trips in total per day (two-way)** are expected during the operational phase.

6.3 DECOMMISSIONING PHASE

The Decommissioning Phase will generate similar trips as the Construction Phase over a similar time period of 36 months. This includes **3 daily truck trips (one-way)** trips for the transportation of the solar panels, **13 daily single unit truck trips (one-way)**, for the transportation of construction materials**, 22 daily staff trips (one-way)** and **1 daily water truck trip (one-way).**

Based on the above, a total of **39 one-way trips per day, i.e. 78 trips in total per day (two-way)** are expected during the 36 month period decommissioning phase.

7. TRIP GENERATION SUMMARY

7.1 TRIP GENERATION SUMMARY FOR PROPOSED 300MW FACILITY

From the trip generation information gathered in **Paragraph 6** the following traffic impacts should be considered:

- Potential congestion and delays on the surrounding road network;
- Potential impact on traffic safety and increase in accidents with other vehicles or animals;
- Potential change in the quality of the surface condition of the roads; and
- Potential noise and dust pollution.

The number of additional daily trips per 400MW solar PV plant and associated electrical grid infrastructure are summarised below. These trips can be expected for the duration of the construction period and decommissioning phase (36 months) and for the operational phase of the project (20 – 30 years).

Construction Phase – 78 Daily Trips (two-way)

- 6 daily truck trips
- 26 daily light load trips
- 44 daily staff transport trips
- 2 daily water truck trips

Operational Phase – 18 Daily Trips (two-way)

- 4 daily light load truck trips
- 12 daily staff transport trips
- 2 daily water truck trips

Decommissioning Phase – 78 Daily Trips (two-way)

- 6 daily truck trips
- 26 daily light load trips
- 44 daily staff transport trips
- 2 daily water truck trips

It is anticipated that the 300MW PV facility will have a 36 to 48-month construction period. From the SANRAL Station 1300 historic traffic information, the AM and PM peak hour trips each constitute approximately 7% of the daily traffic. This relates to approximately an additional 6 trips on the road network during the peak hours for the construction and decommissioning phase and approximately an additional 2 trips on the road network during the peak hours for the operational phase. **The additional trips during the construction, operational and decommissioning phases will have an insignificant traffic impact on the surrounding road network.**

However, possible mitigation measures to address the daily traffic impact are listed below:

- Dust control of the gravel roads.
- Regular maintenance of the gravel access roads.
- Upgrading of the internal farm access road (i.e. internal private roads leading off the Burgerville Road) to suitable standards as specified by the civil engineer and regular maintenance of the access road during all phases of the project, especially during the construction and decommissioning phases.
- The route to the site should be further investigated to ensure that the abnormal loads are not obstructed at any point by geometric, height and width limitations along the route.
- The applicable permits to transport the abnormal loads should be obtained.

7.2 TRIP GENERATION SUMMARY FOR MULTIPLE FACILITIES

Should construction of the facilities listed in **Paragraph 1.7**, **Table 2**, commence at exactly the same time, the cumulative daily trips that can be anticipated are summarised below. For consistency and to simplify the calculations, the following assumptions were made:

- Each facility will be constructed at a rate of 100MW per year;
- Each facility will generate the same trips per 100MW as the study facility;
- Regardless of the size of the facility, only 100MW of the facility are constructed at a time;
- The facilities which sizes are not known, i.e. Map Number 1, 4, 5 and 10 will be disregarded;
- The following facilities will be taken into account: Map Number 2, 3, 6, 7, 8, 9, 11, 12, 13, 14a, 14b and 14c. This equals a total of 12 facilities; and
- Facilities less than 100MW will be assigned the same trips as the 100MW facilities.

Construction Phase – 936 Daily Trips (two-way)

- 72 daily truck trips
- 312 daily light load trips
- 528 daily staff transport trips
- 24 daily water truck trips

Operational Phase – 216 Daily Trips (two-way)

- 48 daily light load truck trips
- 144 daily staff transport trips
- 24 daily water truck trips

Decommissioning Phase – 936 Daily Trips (two-way)

- 72 daily truck trips

- 312 daily light load trips
- 528 daily staff transport trips
- 24 daily water truck trips

Based on the above trip generation rates, an additional 66 trips could be expected on the road network during the peak hours for the construction and decommissioning phase. For the operational phase, an additional 16 trips could be expected on the road network during the peak hours. It is important to note that these trips can be expected on the main road network, i.e along the National Routes (N10) and not on the access road (Burgerville Road) to the proposed 300MW facility. As noted in **Paragraph 5**, the capacity of a Class 1 rural road is in the order of 2000 vehicles per hour (two-way) and the road has sufficient spare capacity to accommodate the additional trips.

However, possible mitigation measures to address the daily traffic impact are listed below:

- Stagger delivery trips and schedule deliveries outside of the peak traffic periods.
- Staff trips should also occur outside of the peak hours where possible.
- The route to each site should be further investigated to ensure that the abnormal loads are not obstructed at any point by geometric, height and width limitations along the route.
- The applicable permits to transport the abnormal loads should be obtained.

8. TRAFFIC IMPACT ASSESSMENT SUMMARY

8.1 TRAFFIC IMPACT ASSESSMENT SUMMARY FOR PROPOSED 300MW FACILITY

The impacts associated with the traffic generation of the proposed 300MW PV facility are summarised in **Table 4** below:

Table 4: Rating of Traffic Related Impacts

Impact	Impact Criteria		Significance and Ranking (Pre-Mitigation)	Potential mitigation measures	Significance and Ranking (Post-Mitigation)	Confidence Level
CONSTRUCTION AND DECOMMISSIONING PHASE						
Congestion and Delays on road network	Status	Neutral	Very Low Risk / Impact (5)	Stagger delivery trips and schedule trips outside of peak hours. Use of flagmen where required to slow down vehicles / warn vehicles of additional traffic / abnormal loads.	Very Low (5)	High
	Spatial Extent	Local				
	Duration	Medium Term				
	Consequence	Slight				
	Probability	Likely				
	Reversibility	High				
	Irreplaceability	Replaceable				
Condition of road surface	Status	Neutral	Very Low Risk / Impact (5)	Regular maintenance of access road by the contractor. Ensure access roads are restored to original pre-construction road condition.	Very Low (5)	High
	Spatial Extent	Local				
	Duration	Medium Term				
	Consequence	Slight				
	Probability	Likely				
	Reversibility	High				
	Irreplaceability	Replaceable				
Dust Pollution	Status	Neutral	Low Risk / Impact (4)	Dust control of gravel roads. Speed control by speed limit road signage.	Low (4)	High
	Spatial Extent	Local				
	Duration	Medium Term				
	Consequence	Moderate				
	Probability	Likely				
	Reversibility	High				
	Irreplaceability	Replaceable				
Noise Pollution	Status	Neutral	Low Risk / Impact (4)	Stagger delivery trips.	Low (4)	High
	Spatial Extent	Local				
	Duration	Medium Term				
	Consequence	Moderate				
	Probability	Likely				
	Reversibility	High				
	Irreplaceability	Replaceable				
Bellmouth Widening	Status	Neutral	Low Risk / Impact (4)	Speed control during the construction of the widening by means of stop and go system with the addition of flagmen, speed limit road signage and construction warning signage.	Low (4)	High
	Spatial Extent	Local				
	Duration	Short Term				
	Consequence	Slight				
	Probability	Likely				
	Reversibility	High				
	Irreplaceability	Replaceable				
OPERATIONAL PHASE						

Regular maintenance of the access road by the operator will be required to ensure that the condition of the road surface will remain as it was before construction and operation of the solar PV plant commenced.

The traffic generated during the operational phase will not have a significant impact on the surrounding road network.

8.2 TRAFFIC IMPACT ASSESSMENT SUMMARY FOR MULTIPLE FACILITIES

The cumulative impacts of all the proposed renewable energy facilities that were included in the vicinity were considered and assessed. It is however very unlikely that all projects will occur at the same time, as all these projects will be subject to a highly competitive bidding process and only a few projects would be allowed to enter into a power purchase agreement with Eskom at a time. Furthermore, Eskom's transmission infrastructure has limited capacity and will only be able to receive electricity from a limited number of renewable energy projects on a first come first served basis. Construction will most likely be staggered based on project and site-specific issues.

The biggest traffic impact associated with renewable energy facilities is during the construction phase (and similarly during the decommissioning phase). During the operational phase, the trips added to the road network is expected to be insignificant. It should be noted that all the applications for abnormal load transport are considered by the applicable authorities, and they will ensure that the trips are staggered on the road network to limit possible delays.

The impacts associated with the cumulative traffic generation of the renewable energy facilities within a 30km radius of the proposed 300MW solar photovoltaic facility are summarised in **Table 5** below:

Table 5: Rating of Cumulative Traffic Related Impacts

Impact	Impact Criteria		Significance and Ranking (Pre-Mitigation)	Potential mitigation measures	Significance and Ranking (Post-Mitigation)	Confidence Level
CONSTRUCTION AND DECOMMISSIONING PHASE						
Congestion and Delays on road network	Status	Neutral	Low Risk / Impact (4)	Stagger delivery trips and schedule trips outside of peak hours.	Very Low (5)	High
	Spatial Extent	Local				
	Duration	Medium Term				
	Consequence	Substantial				
	Probability	Very Unlikely				
	Reversibility	High				
	Irreplaceability	Replaceable				
Potential impact on traffic safety and increase in accidents with other vehicles and animals	Status	Neutral	Low Risk / Impact (4)	Speed control by means of stop and go system with the addition of flagmen, speed limit road signage and construction warning signage.	Low (4)	High
	Spatial Extent	Local				
	Duration	Medium Term				
	Consequence	Moderate				
	Probability	Likely				
	Reversibility	High				
	Irreplaceability	Replaceable				
	Status	Neutral			Very Low (5)	High

Impact	Impact Criteria		Significance and Ranking (Pre-Mitigation)	Potential mitigation measures	Significance and Ranking (Post-Mitigation)	Confidence Level
Condition of road surface	Spatial Extent	Local	Low Risk / Impact (4)	Regular maintenance of access roads by the contractor. Ensure access roads are restored to original pre-construction road condition.		
	Duration	Medium Term				
	Consequence	Substantial				
	Probability	Very Unlikely				
	Reversibility	High				
	Irreplaceability	Replaceable				
Dust Pollution	Status	Neutral	Low Risk / Impact (4)	Dust control of gravel roads. Speed control by means of stop and go system and speed limit road signage.	Low (4)	High
	Spatial Extent	Local				
	Duration	Medium Term				
	Consequence	Severe				
	Probability	Very Unlikely				
	Reversibility	High				
	Irreplaceability	Replaceable				
Noise Pollution	Status	Neutral	Low Risk / Impact (4)	Stagger delivery trips.	Low (4)	High
	Spatial Extent	Local				
	Duration	Medium Term				
	Consequence	Severe				
	Probability	Very Unlikely				
	Reversibility	High				
	Irreplaceability	Replaceable				
OPERATIONAL PHASE						
The traffic generated during the operational phase will not have a significant impact on the surrounding road network.						

9. CONCLUSIONS AND RECOMMENDATIONS

Sturgeon Consulting (Pty) Ltd prepared this Transport Impact Assessment (TIA) for the proposed construction and operation of the 300MW solar photovoltaic (PV) facility on several portions of farms in the Hanover District, Emthanjeni Local Municipality, Northern Cape Province. This report summarises the existing transportation conditions within the site vicinity and provides an assessment of the transportation impacts of the proposed development on the surrounding transport system.

From the traffic impact investigation and discussions in the report the following conclusions can be made:

- The main gravel road, Burgerville Road, in the vicinity of the proposed development is in a fair to poor condition.
- The main surfaced road, the N10, in the vicinity of the proposed development is in a good condition.
- The preferred route for the haulage of imported materials is from the Port of Ngqura along the N10.
- The primary access to the proposed facility will be from the N10 along the Burgerville Road.
- The bellmouth of the western Burgerville Road approach at the N10 / Burgerville Road intersection must be widened to allow for a 22m turning circle.
- Direct access to the proposed development will be taken off the Transnet servitude road at the existing access to the subject property, approximately ±4.65km southeast of where Burgerville Road crosses the railway line. This access will be utilized by passenger and small delivery vehicles.
- The transformers will be delivered on flatbed trucks that may not fit under the Transnet electrical lines. Therefore, these trucks will access the subject property along Burgerville Road approximately 5.11km northeast of the N10 / Burgerville Road intersection.
- The accesses comply with sight distance requirements.
- Existing traffic information for 2022 indicates that the N10 carries an ADT of **1018 vpd** (two-way) with the highest hourly volume being **186 vph** (two-way).
- The N10 operates well below the capacity of 2000 vehicles per hour for a Class 1 principal arterial with two lanes.
- Traffic will be generated during the Construction, Operational and Decommissioning phases of the project.
- During the Construction and Decommissioning phases, an additional **78 daily trips (two-way)** and **6 peak hour trips (two-way)** will be generated by the 300MW solar PV facility.
- The following traffic impacts are related to the trips generated during the Construction and Decommissioning phases:
    - Potential congestion and delays on the surrounding road network

  - Potential impact on traffic safety and increase in accidents with other vehicles or animals
  - Potential change in the quality of the surface condition of the roads
  - Potential noise and dust pollution.
- Traffic generated during the Operational phase will have an insignificant traffic impact on the surrounding road network

The mitigation measures to address the traffic impact are recommended:

- Stagger delivery trips and schedule deliveries outside of the peak traffic periods.
- Staff trips should also occur outside of the peak hours where possible.
- Dust control of the gravel roads.
- Speed limits be implemented to ensure reduced speeds along the roads.
- Speed control during the construction of bellmouth widening of the Burgerville Road approach at the N10 / Burgerville Road intersection by means of stop-and-go system with additional flagmen.
- Regular maintenance of the gravel external access roads by the contractor during the construction period and the operator during the operational phase.
- Upgrading of the internal access road to suitable standards as specified by the civil engineer and regular maintenance of the access road during all phases of the project, especially during the construction and decommissioning phases.
- The route to the site should be further investigated to ensure that the abnormal loads are not obstructed at any point by geometric, height and width limitations along the route.
- The applicable permits to transport the abnormal loads should be obtained.

No other remedial or mitigation measures will be required to accommodate the additional traffic generated by the proposed Solar Photovoltaic Facility.

Provided that the above recommendations are adhered to, the proposed development of the 300MW Solar PV facility (Phase 2) can be supported from a traffic engineering perspective.

REFERENCES

1. Department of Transport, Guidelines for Traffic Impact Studies, Report No. PR93/645, Pretoria, 1995.
2. Department of Transport, South African Trip Generation Rates, Report No. RR92/228, Pretoria, 1995.
3. Committee of Transport Officials (COTO), South African Trip Data Manual, TMH 17, Committee Draft 2.2, August 2020.
4. Committee of Transport Officials (COTO), South African Traffic Impact and Site Traffic Assessment Manual Standards and Requirements Manual, Volume 2 TMH 16, Committee Draft 2.0, October 2020.
5. Committee of Transport Officials (COTO), South African Traffic Impact and Site Traffic Assessment Manual, Volume 1 TMH 16, Committee Draft 2.0, May 2018.
6. SANRAL Geometric Design Guide
7. Department of Transport, TRH17, Geometric Design of Rural Roads, 1988
8. Solarafrica Sun Central – Access Road, Solar Africa, 2022

APPENDIX A:
CURRICULUM VITAE OF ANNEBET KRIGE