PHALA SOLAR POWER PLANT (RF) (PTY) LTD

TRAFFIC IMPACT ASSESSMENT FOR THE DEVELOPMENT OF THE PHALA SOLAR POWER PLANT NEAR BELA-BELA, LIMPOPO PROVINCE

32745.12C-REP-001-00

TRAFFIC IMPACT ASSESSMENT

DECEMBER 2022

PREPARED FOR:

PHALA SOLAR POWER PLANT (RF) (PTY) LTD

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EXECUTIVE SUMMARY

BVi Consulting Engineers Western Cape (Pty) Ltd was appointed by *Phala Solar Power Plant (RF) (Pty) Ltd* to conduct a Traffic Impact Assessment (TIA) for the proposed development of a 350 MW photovoltaic solar power plant near Bela-Bela in the Limpopo Province. This specialist study forms part of the environmental assessment.

Regional and local transport routes were investigated for the traffic assessment as follows:

- Haulage routes from various ports of entry (Durban Harbour and Richards Bay Harbour) were assessed for impact as regional routes.
- Routes close to the site were assessed for impact of local trips on the local network.
- The existing traffic volumes on the transportation routes were sourced and used to calculate the current background traffic, the expected background traffic during construction and, thereby, the Level of Service (LOS). The number of trips generated from the construction period were estimated and the impact of these additional trips on the regional and local transport routes were also investigated.

The following conclusions can be drawn from the traffic and transportation study:

- The major traffic impact occurs during the construction phase of the project. The impact of the construction trip generation, on the predicted 2026 (estimated time of construction) traffic volumes on the local and the regional transportation routes are expected to be low. No mitigation measures for these routes will be necessary due to additional development traffic.
    - The photovoltaic (PV) components will be delivered to site from the recommended Durban Harbour over a distance of 720 km along the N3 and N1. The regional routes indicated in the analysis would, however, need to be confirmed by freight carriers as suitable for the sensitive normal loads. The final decision on the selected route would be based on a combination of cost, distance and road condition at the time of transport.
- All construction materials and solar modules will be transported via normal loads. Transformer and substation components will be transported via abnormal loads.
- In terms of impact on roads infrastructure:
    - The preferred access point to the site will be via the eastern and western sides of the R101, along the proposed northern site boundary. The formalisation of this access point, to the standard, might be a requirement as part of the wayleave approval of the *Limpopo Department: Transport and Community Safety* and/or *South African National Roads Agency Ltd*.
    - Due to the high volumes on R101, it may be required that the access may require acceleration/deceleration lanes.

- It is proposed that the access roads in close proximity to the site be investigated for rehabilitation prior to construction and be maintained during construction in order to mitigate against the possibility of damaged goods due to poor road infrastructure.
- Adequate traffic accommodation signage must be erected and maintained on either side of the access throughout the construction period of the project.
- The construction and provision of internal roads that cross the Eskom servitude need to be according to Eskom wayleave requirements.
- The construction in the vicinity of and over the existing railway line will also need to adhere to the rail authority's requirements.

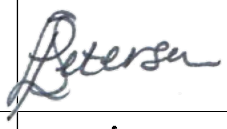
- In terms of impact on traffic:
  - The regional construction trips will be insignificant when compared to the existing Average Daily Traffic (ADT) and projected ADT without the development. It has been noted that the N1 and R101 in the region of the site is already at a low level of service, without the addition of the proposed development. The layout of the access to the site, at the intersection with the R101 may require acceleration/deceleration lanes as part of the mitigation due to the high existing traffic.
- In terms of cumulative impact:
  - The direct impact and significance of the Phala SPP is considered low. The cumulative impact and significance of the various nearby renewable energy projects is considered to have a low/ negligible impact. Mitigation measures that may be considered, should concurrent construction occur, include the staggering of trips at the site and the implementation of a roads maintenance programme..

With the consideration of the recommendations of this report, the development of the Phala SPP, located on the Remaining Extent of Portions 1 and 2 of the Farm Turfbult No. 494, and Portions 5 and 7 of the Farm Turfbult No. 494, Waterberg Local Municipality (Limpopo Province) is supported from a traffic and transportation perspective.

Locality Plan

ISSUE AND REVISION RECORD

QUALITY APPROVAL

	Capacity	Name	Signature	Date
Author 1	Professional Engineer	Adrian Tarrant Pr Eng: 201705088		07/12/2022
Author 2	Professional Engineer	Lee-Ann Petersen Pr Eng: 20180198		07/12/2022
Reviewed by	Engineer	Liza Botha Candidate: 201651236		07/12/2022
Reviewed by	Professional Engineering Technologist	Jacques Nel Pr Tech Eng: 200770131		07/12/2022
Approved by Design Centre Leader	Director	Dirk van der Merwe Pr Eng: 20120186		07/12/2022

This report has been prepared in accordance with BVi Consulting Engineers Quality Management System. BVi Consulting Engineers is ISO 9001: 2015 registered and certified by NQA Africa.

REVISION RECORD

Revision number	Objective	Change	Date
0	Issue to Client for comments	None	07/12/2022

TRAFFIC IMPACT STUDY COVER PAGE

INFORMATION ITEM	DETAILS/ DESCRIPTION
Municipality Name	Bela-Bela Local Municipality; and Waterberg District Municipality
Type of Assessment	Traffic Impact Assessment
Erf Numbers/ Farm Names	Remaining Extent of Portions 1 and 2 of the Farm Turfbult No. 494, and Portions 5 and 7 of the Farm Turfbult No. 494
Date of Report	07 December 2022
Details of Assessor	DJP van der Merwe Pr Eng
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DJP van der Merwe Pr Eng

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CHAPTER 1 INTRODUCTION

1.1 TERMS OF REFERENCE

BVi Consulting Engineers Western Cape (Pty) Ltd was appointed by *Phala Solar Power Plant (RF) (Pty) Ltd* to conduct a Traffic Impact Assessment (TIA) for the proposed development of the Phala Solar Power Plant near Bela-Bela, Limpopo Province. This proposed development is made up of a photovoltaic (PV) solar energy facility (SEF) with a generation capacity of up to 350 MW. This specialist study forms part of the requirements for the environmental assessment process.

1.2 OBJECTIVES

The objectives of this specialist traffic and transportation study are:

- To identify the most optimal shipping port(s) and assess feasible transport routes, route lengths and potential constraints for facility components;
- To determine the potential indirect, direct and cumulative risks/ impacts to receptors from a traffic and transportation perspective for this project;
- To propose mitigation measures for identified significant risks/ impacts and enhance positive risk/ impacts of the project; and
- To ensure that the project operations comply with relevant environmental standards, policies, laws and regulations in terms of traffic and transportation.

1.3 APPROACH AND METHODOLOGY

The traffic and transportation study deals with the traffic impact on the surrounding road network during three distinct phases: *construction phase*, *operational phase* and *decommissioning phase*. The study considered and assessed the following:

- Site layout, access points and internal roads assessment:
  - Description of the surrounding road network;
  - Description of site layout;
  - Assessment of proposed access points; and
  - Assessment of proposed internal roads.

- Traffic and transportation assessment:
  - Estimation of trip generation;
  - Discussion of potential traffic impacts;
  - Assessment of possible transportation routes; and
  - Assessment of construction, operational (maintenance) and decommissioning phases' vehicle trips.

1.4 ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations apply to this traffic and transportation study:

- This study is based on the project information provided by the environmental consultants and project managers for the applicant, *Phala Solar Power Plant (RF) (Pty) Ltd*;
- Typical *Eskom* specifications for power transformers were used and the following dimensional limitations need to be adhered to when transporting the transformers:
  - Height: 5000 mm;
  - Width: 4300 mm; and
  - Length: 10 500 mm.
- Imported PV power plant components will be transported from the most feasible port of entry;
- If any elements are manufactured within South Africa, these would be transported from their respective manufacturing centres, which would be either in the greater Johannesburg, Pinetown/Durban or Cape Town for the transformer, inverter and the support structures;
- Civil construction materials, for concrete and wearing course, will be sourced on nearby towns where possible;
- All other construction materials, for concrete and wearing course, would be sourced from a local licensed quarry (off-site); and
- Maximum vertical height clearances along the transportation route is 5.2 m for abnormal loads.

1.5 REFERENCE DOCUMENTATION

The following documents were used in compiling this report and will be referenced as required:

- *Highway Capacity Manual (HCM) 2010*, published by the Transportation Research Board, December 2010.
- *Project Description Document: The Development of the Phala Solar Power Plant near Bela-Bela, Limpopo Province*, prepared by *Environamics, November 2022*.
- *TRH 11: Dimensional and Mass Limitations and Other Requirements for Abnormal Load Vehicles*, published by the Department of Transport (DoT), August 2009.
- *TRH 17: Geometric Design of Rural Roads*, published by the Department of Transport (DoT), 1988.
- *TRH 26: South African Road Classification and Access Management Manual*, published by the Committee of Transport Officials (COTO), August 2012.

CHAPTER 2 PROJECT PARTICULARS

2.1 PROJECT DESCRIPTION AND SITE LOCATION

The proposed Phala Solar Power Plant (SPP) development site is located on the Remaining Extent of Portions 1 and 2 of the Farm Turfbult No. 494, and Portions 5 and 7 of the Farm Turfbult No. 494 approximately 4 km southeast of Bela-Bela in the Limpopo Province and forms part of the *Waterberg Local Municipality* and the *Bela-Bela District Municipality*. The proposed site has an overall development footprint of approximately 570 ha with a maximum installed generating capacity of 350 MW. The locality plan is shown in *Figure 2.1*.

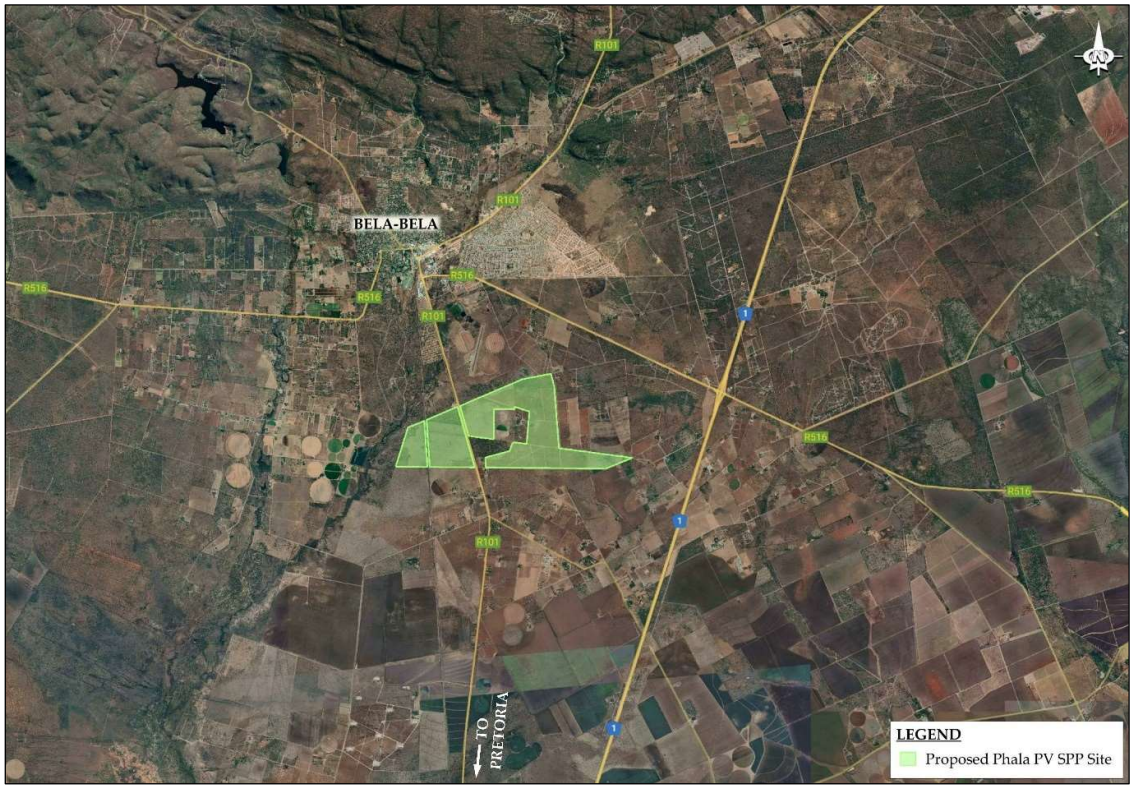


Figure 2.1: Location of the proposed Phala SPP

The layout of the site is characterized by separate parcels of development of the solar plant, according to the constraints on site. The internal road layout and the fencing indicates the separation between the development areas with the consideration of the following:

- Existing external road network,
- Existing railway line,
- Electrical powerlines, servitudes and related infrastructure, and
- Environmental no-go areas.

2.2 EXISTING EXTERNAL TRANSPORT NETWORK

2.2.1 Existing road network

The existing external road network, in the vicinity of the Phala SPP development site, is shown in *Figure 2.2*.

Figure 2.2: Existing external road network surrounding the Phala SPP

An overview of the road classification for the major roads has been undertaken and was derived from the S*outh African Classification and Access Management Manual (TRH 26)*.

- R101 is a two-lane, two-way (undivided) surfaced roadway and is classified as a Class 3 Rural Minor Arterial. To the north, this roadway connects to the N1, just north of Polokwane and to the south, it connects to the M1 within the City of Johannesburg (near the suburb of Morningside), to the south of the proposed site.
- R516 is a two lane, two way roadway surfaced roadway and is classified as a Class 3 Rural Minor Arterial. This road connects the R101 in the west with the R519, to the east of the proposed site.
- D1985 is a two lane, two-way roadway that is unsurfaced and is classified as a Class 4 Collector Street. This roadway serves to connect the R101 (in the north) with the area to the south-east of this roadway and provides direct access to the various farms (and schools) located in this area.

- Farm Access Road is an existing access road located on the northern site boundary (to the east of the R101) and is a two-way, two lane roadway. This road is classified as a Class 5 Rural Local Road. The road serves to provide direct access to the existing surrounding farms.

It should be noted that the majority of the other roadways immediately surrounding the proposed project site (as shown in *Figure 2.2*) are unsurfaced (i.e., gravel or sand-based) roadways classified as Class 5 Local Roads and primarily fulfil an access function for neighbouring farms.

2.2.2 Existing rail network

In addition to the road network, the site is affected by a railway line running parallel to and to the west of the R101.

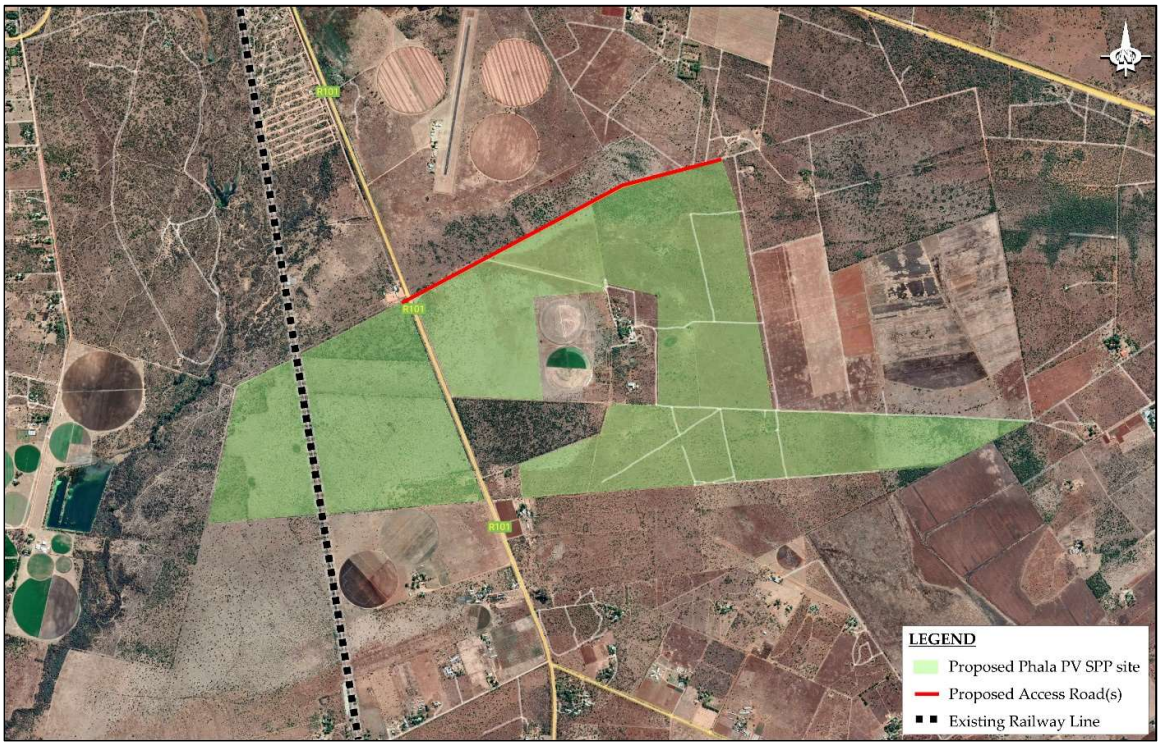


Figure 2.3: Existing railway line across site

According to the site layout, the site is divided by the railway line. The layout indicates fencing around each parcel as affected. It should be noted that any rail crossings or distance to proposed development from the railway line will need to comply with the requirements of the relevant rail authority.

2.3 PROPOSED SITE LAYOUT

The proposed layout and associated infrastructure of the proposed Phala Solar Power Plant is considered for the estimation of construction and operational traffic. The Phala SPP will cover approximately 570 ha and the associated infrastructure is listed as follows:

- PV panel array - To produce up to 350 MW.
- Wiring to inverters - Sections of the PV array will be wired to inverters.
- Connection to the grid - Connecting the array to the electrical grid requires transformation of the voltage from 480 V to 33 kV to 132 kV. An onsite substation will be required on the site to step the voltage up to 132 kV. It is expected that generation from the facility will connect to the national grid via the existing Eskom Warmbad 275/132/66kV MTS Substation.
- Electrical reticulation network – An internal electrical reticulation network will be required and will be lain.
- Supporting infrastructure – The supporting infrastructure such as the auxiliary buildings and laydown areas will be situated in an area measuring up to 1.3 ha.
- Battery storage – A Battery Storage Facility with a maximum height of 8 m and a maximum volume of 1,740 m^3 of batteries and associated operational, safety and control infrastructure.
- Roads – Access will be obtained via the R101 regional road. An internal site road network will also be required to provide access to the solar field and associated infrastructure. The access road and internal roads will be constructed within a 25 m corridor.
- Fencing - For health, safety and security reasons, the facility will be required to be fenced off from the surrounding farm. Fencing with a height of 2.5 m will be used.

2.4 PROPOSED SITE ACCESS

Access to the Phala SPP is proposed via an existing access road located east of the R101 and via a new access road, located to the west of the R101 (located opposite the existing access road). An overview of these accesses is as also shown in *Figure 2.3*.

It should be noted that a formal assessment of the proposed access alternatives and typical access road requirements will be undertaken in *Chapter 3*.

CHAPTER 3 SITE ACCESS AND INTERNAL ROAD NETWORK

3.1 MINIMUM ACCESS SPACING REQUIREMENTS

An overview of the spacing between existing accesses / roads as well as for the two proposed site access alternatives is shown in *Figure 3.1*.

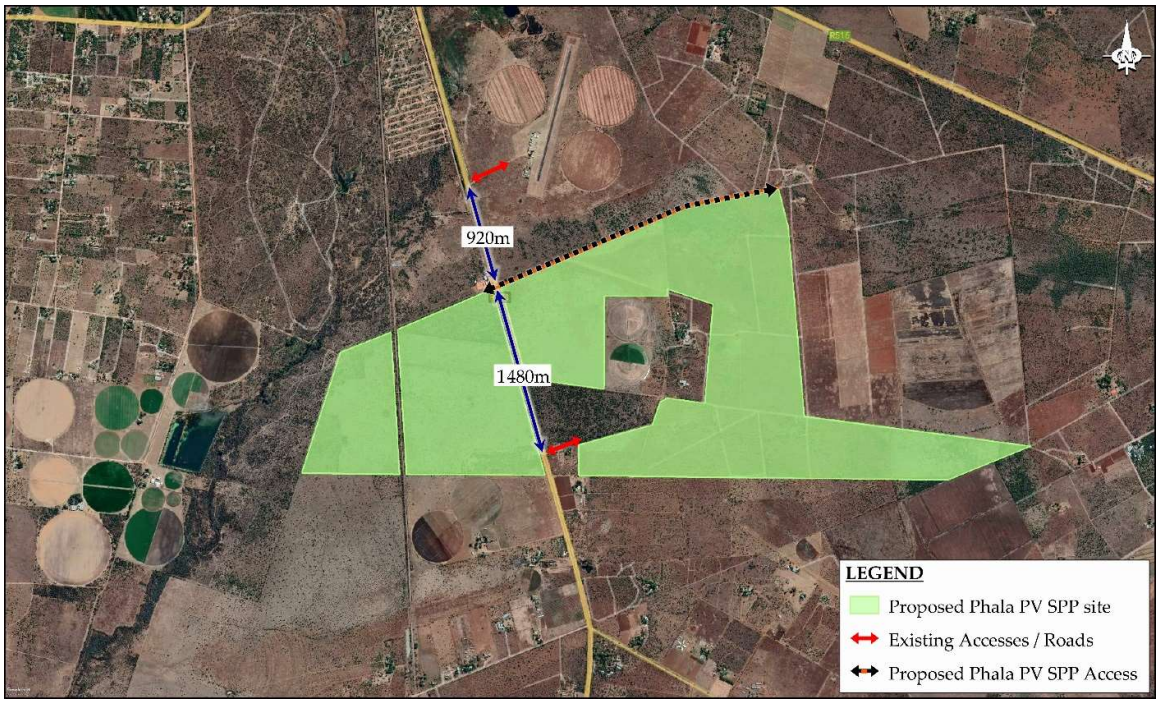


Figure 3.1: Existing and proposed access spacing

The above figure shows that there are a number of existing farm accesses located on the on the eastern and western sides of the R101 in the vicinity of the proposed development site. The proposed eastern and western accesses are positioned directly opposite one another, approximately 920m and 1 480m to the south and north of the proposed site accesses, respectively.

It should be noted that in terms of the *TRH26* manual, low volume farm accesses (less than 20 vehicles per day) are allowed on Class R3 Rural Minor Arterial roadways. It is estimated that the proposed development will generate a similar amount of daily vehicle trips. As such, the proposed development access is considered to be in a similar category to a low volume farm access.

3.2 POSITIONING OF SITE ACCESS ROAD FOR PROPOSED DEVELOPMENT SITE - DISCUSSION

As per *Chapter 3.1*, it has been determined that low volume farm accesses are not typically governed by a specific set of minimum access spacing requirements (detailed in *TRH26*). Notwithstanding, access to the proposed Phala SPP site via the R101 represents the most direct route, is more appropriate in terms of servicing of haulage vehicle volumes and other development-generated traffic and is therefore considered the preferred option. It is; however, further recommended that the adjacent accesses to the farms i.e., to the east and west of the R101 (located to the south of the proposed accesses) are closed off as part of the development of the site. A formal application for the recommended access point will need to be lodged with the *Bela-Bela Local Municipality* and the *Limpopo Department of Transport and Community Safety* and/or *South African National Roads Agency Ltd*. The formalisation of this access point to the typical minimum design standard (*Appendix A*), will likely be a requirement as part of the wayleave approval. In addition, it must be noted that adequate traffic accommodation signage must be erected and maintained on either side of the access, throughout the construction phase of the project.

3.3 INTERNAL ROAD NETWORK

The preliminary site layout indicates a general north-south internal road layout, with roads along the perimeter of each development section. According to the technical details received, the length of the internal roads is indicated as approximately 30 km.

These internal roads are generally only used for the cleaning and maintenance of the solar modules. It is proposed that the following geometric and pavement design parameters be considered for the initial design of the internal roads:

Geometric design parameters:

- Road width: 4 - 6 m
- Minimum longitudinal gradient: 0.5%
- Maximum longitudinal gradient: 10%
- Absolute maximum longitudinal gradient: 14%
- Road cross-fall: 2%
- Maximum hardstand resultant cross-fall: 1%
- Cut and fill slopes: 1 : 1.5
- Minimum horizontal radius: 30 m
- Minimum intersection radius: 15 m
- Minimum vertical radius (sag and crest): 100 m

Pavement design:

- Pavement design to be evaluated according to the *TRH 4: Structural Design of Flexible Pavements for Interurban and Rural Roads* document for surfaced roads and *TRH 20: The Structural Design, Construction And Maintenance Of Unpaved Roads* for unsurfaced roads.
- Proposed layerworks:
  - 150 mm gravel wearing course compacted to 95% MOD AASHTO;
  - 150 mm subbase layer compacted to 93% MOD AASHTO (unless in-situ CBR > 15%); and
  - In-situ compacted to 93% MOD AASHTO or 3 roller pass compaction, if rock.
- It is anticipated that material generated from earthworks operations on site will be suitable for the internal roads. Alternatively, establishing a local borrow pit is recommended, to limit the material transport distance.

It should be noted that in general, the proposed gravel access road to the site will need to be suitably maintained. Re-gravelling may be necessary as a maintenance measure, from time to time, throughout the operational life of the project. It is, however, essential that adequate traffic accommodation signage be erected and maintained on either side of the accesses on the R101. This should be implemented throughout the construction phase of the plant.

CHAPTER 4 TRANSPORTATION ROUTES

4.1 OVERVIEW

Transportation routes affected by the construction and operation of the Phala SPP have been investigated and will be discussed in this section. It is anticipated that the solar panel technology and large electrical components will be imported and arrive at ports of entry via sea. It is therefore necessary to identify the optimal shipping port(s) from which large components could be delivered to the region. Furthermore, it is necessary to undertake an assessment of these identified feasible transportation routes, route lengths and potential constraints that may be encountered during future phases of the project.

4.2 HAULAGE FROM SHIPPING PORT(S) - NORMAL LOADS

A high-level assessment of the distances between the proposed development site and all seven ports-of-entry located within South Africa is provided in *Table 4.1* below.

Table 4.1: Location of ports of entry relative to proposed development site

PORT	SHORTEST DISTANCE BETWEEN PORT AND SITE
Durban	*720km*
Richards Bay	*757km*
East London	1 121km
Coega (Ngqura)	1 191km
Gqeberha	1 210km
Cape Town	1 561km
Saldanha	1 601km

Due to their proximity to the proposed development site, two possible ports-of-entry have been identified from where the solar panel technology and large electrical components will be transported i.e., Durban and Richards Bay. These two ports were selected as they represent the shortest travel distance to the proposed development site.

A brief explanation of the four alternative routes is described in *Table 4.2* and *Table 4.3* and shown in *Figure 4.1* and *Figure 4.2* respectively:

- Durban Port
  - Alternative 1 via the N3, comprising a total distance of 720 km; and
  - Alternative 2: via the N11, comprising a total distance of 774 km.

- Richards Bay Port
  - Alternative 3: via the N2 comprising a total distance of a 757 km; and
  - Alternative 4: via the R34, comprising a total distance of 765 km.

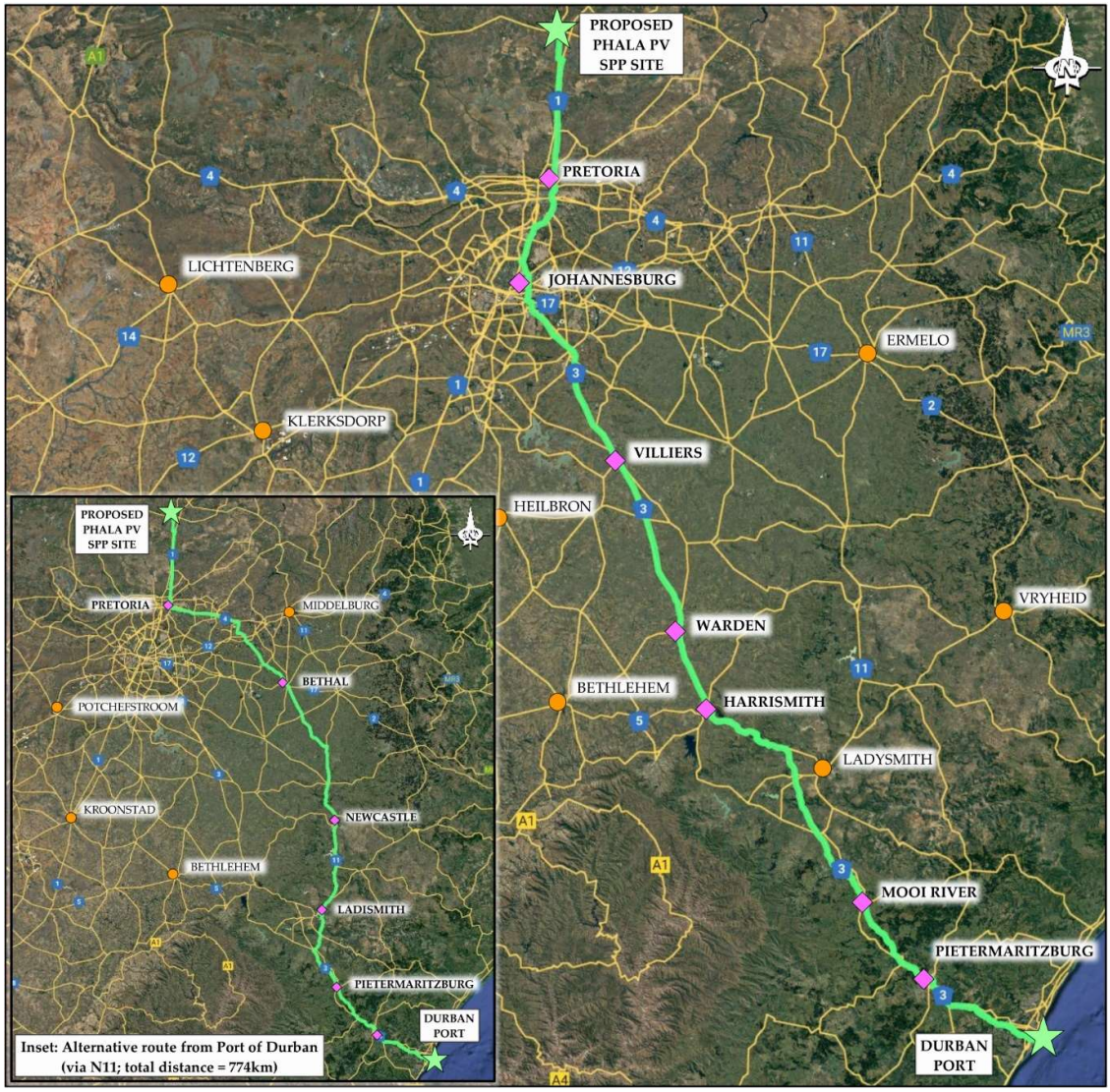


Figure 4.1: Shortest haulage route from Port of Durban to Phala SPP (via N3 – total distance = 720 km)

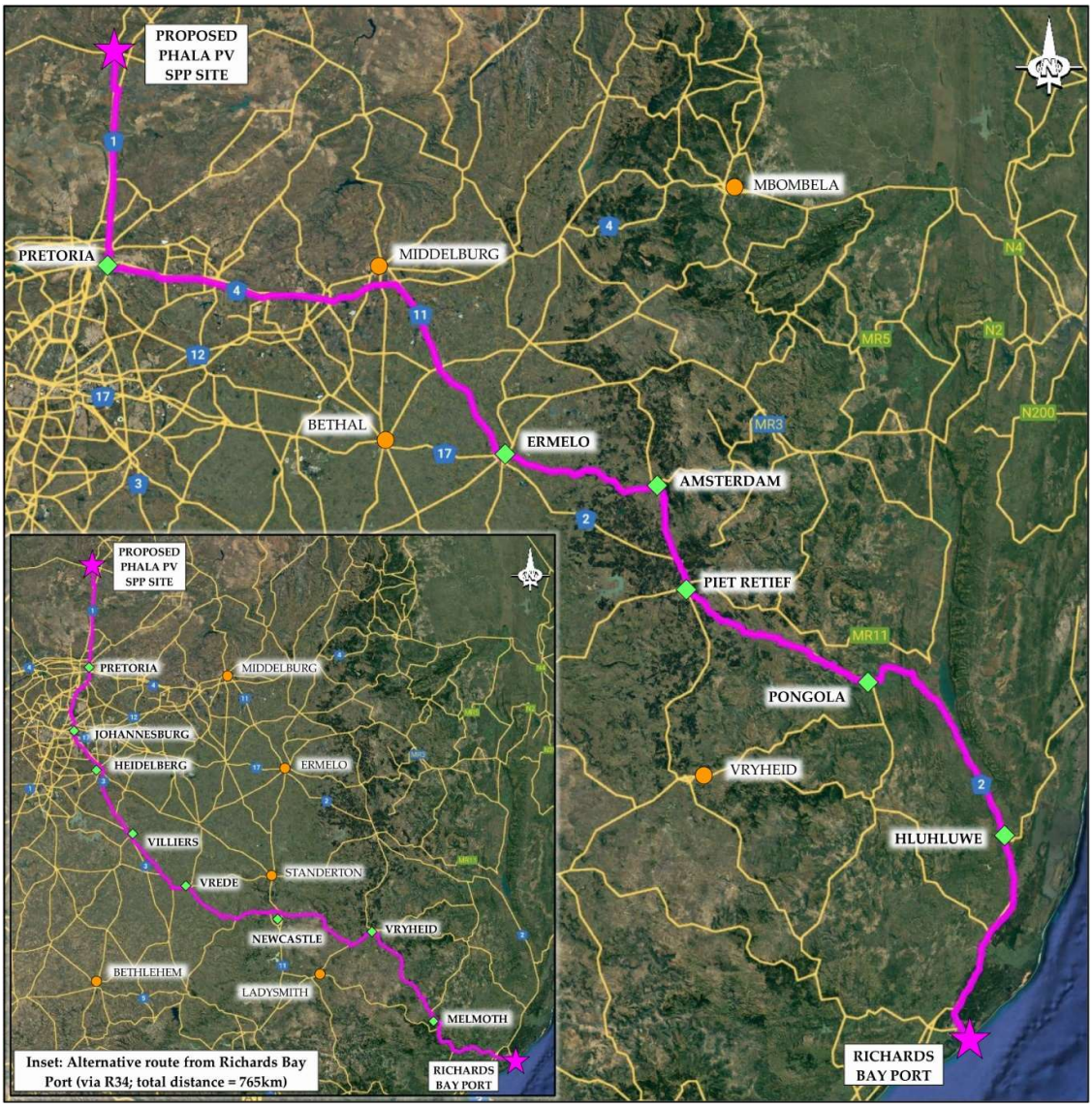


Figure 4.2: Shortest haulage route from Richards Bay Port to Phala SPP (via N2 – total distance = 757 km)

Table 4.2: Route overview – Port of Durban origin

ALTERNATIVE ROUTE 1 (VIA THE N3) – 720 km	ALTERNATIVE ROUTE 2 (VIA THE N11) – 774 km
• Head northeast on the M7, merging onto the N3 at Pinetown. • Continue on the N3 and pass through Pietermaritzburg, Howick, Mooi River and Estcourt. • Remain on the N3 and pass through Harrismith, Warden, Villiers and Heidelburg. • Just after passing through Vosloorus, take the exit onto the N12 (northbound). • At the 104-Buccleuch Interchange, keep left and follow the signs for M1 towards Johannesburg. • Keep right at the fork to continue on Exit 104, follow signs for N1 / Pretoria / Polokwane and merge onto the N1. • Take Exit 124 to merge onto the N1 towards Pretoria / Polokwane. • Continue on the N1 and travel through Pretoria, passing by Hammanskraal. • Take Exit 224 towards R576 / Bela-Bela / R516 / R101 and turn right onto the R101. • Continue on the R101 (northbound) for approximately 13.5km and then perform a right-turn or left-turn to access the Phala SPP site.	• Head northeast on the M7, merging onto the N3 at Pinetown. • Continue on the N3 and pass through Pietermaritzburg, Howick, Mooi River and Estcourt. • Take Exit 194 for R74 toward R103 / Colenso and Bergville. • After passing through Colenso perform a right-turn to continue on R103. • On approach to Ladysmith, perform a left-turn at the T-junction, onto P32. • Continue into Ladysmith and perform a right-turn onto the N11 at the T-junction. • Travel northbound on the N11 and travel through Newcastle, Volksrust. • At Amersfoort, perform a left turn onto the R35 and travel north-westbound. • After passing through the town of Bethal, turn left onto the N17 and take Exit 267 to join the R545 and continue travelling northbound. • On approach to Balmoral, merge onto the N4 (left-turn), continue westbound towards Pretoria and take Exit 145 to merge onto the N1 and travel northbound. • Continue on the N1 and travel through Pretoria, passing by Hammanskraal. • Take Exit 224 towards R576 / Bela-Bela / R516 / R101 and turn right onto the R101. • Continue on the R101 (northbound) for approximately 13.5km and then perform a right-turn or left-turn to access the Phala SPP site.

Table 4.3: Route overview – Port of Richards Bay origin

ALTERNATIVE ROUTE 3 (VIA THE N2) – 757 km	ALTERNATIVE ROUTE 4 (VIA THE R34) – 765 km
• Travel northbound to connect onto the R34, and continue westbound, performing a right-turn onto the R619. • Travel through Richards Bay Central and perform a right-turn to merge onto the N2. • Continue northbound on the N2 and pass through KwaMsane, pass-by Hluhluwe and Mkuze. • Continue on the N2, crossing over the Phongolo River. • Still on the N2 (travelling westbound), pass through the towns of Pongola, Mkhwakhweni and Piet Retief. • Approximately 10.5km after passing through Piet Retief, perform a right-turn onto the R33. • After entering the town of Amsterdam, perform a left-turn onto the R65 and continue travelling westbound. • Upon reaching Ermelo, perform a left-turn onto the N17 and then perform a right-turn onto the N11 (travelling northbound). • Travel through the town of Hendrina and just before reaching Middelburg, merge onto the N4 (by performing a left-turn). • Continue travelling westbound and pass through Witbank, Balmoral, Bronkhorstspruit and travel into Pretoria. • Take Exit 145 to merge onto the N1 towards Pretoria / Polokwane. • Continue on the N1 and travel through Pretoria, passing by Hammanskraal. • Take Exit 224 towards R576 / Bela-Bela / R516 / R101 and turn right onto the R101. • Continue on the R101 (northbound) for approximately 13.5km and then perform a right-turn or left-turn to access the Phala SPP site.	• Travel northbound to connect onto the R34, and continue westbound, performing a right-turn onto R66 (near Covington). • Continue on the R66 through Melmoth before merging onto the R34 (by keeping in the left-most lane). • Travel northbound on R34, passing through Dwarsrivier and on approach to Vryheid, perform a left-turn to remain on R34. • Travel westbound for approximately 23km and then perform a right-turn onto R34. • After passing Newcastle (on left-hand side) perform a right-turn onto the N11, turning left at the first cross-street, take a slight left and then turn right to remain on the R34. • Continue on the R34 and travel through Memel and Vrede, perform a right-turn onto R103 and continue through Cornelia. • At the town of Villiers merge onto the N3, travel northbound on the N3 through Heidelberg. • Just after passing through Vosloorus, take the exit onto the N12 (northbound), keep right to continue on N3 Eastern Bypass / N12 / N3. • At the 104-Buccleuch Interchange, keep left and follow the signs for M1 towards Johannesburg. Keep right at the fork to continue on Exit 104, follow signs for N1 / Pretoria / Polokwane and merge onto the N1. • Take Exit 124 to merge onto N1 (NB). Continue on the N1 and travel through Pretoria, passing by Hammanskraal. • Take Exit 224 towards R576 / Bela-Bela / R516 / R101 and turn right onto the R101. • Continue on the R101 (northbound) for approximately 13.5km and then perform a right-turn or left-turn to access the Phala SPP site.

It should be noted that the Port of Durban is South Africa's main cargo and container port, handling the largest volume of sea-going traffic of any port in southern Africa. It is ideally placed on major shipping routes and has excellent rail and road links. Furthermore, based on the shortest travel distance, it is recommended that the Port of Durban is the preferred port of entry and thus *Alternative 1* (via the N3) is the recommended haulage route.

The regional routes indicated in the analysis would, however, need to be confirmed by freight carriers as suitable for the sensitive normal loads. The final decision on the selected route would be based on a combination of cost, distance and road condition at the time of transport.

4.3 HAULAGE FROM LOCAL MANUFACTURERS - ABNORMAL LOADS

Transformer and substation components are envisaged to form part of the regional trips. It is anticipated that these components would be imported and transported from the preferred harbour (Durban Port is recommended) as abnormal loads. It would then be assembled in Johannesburg and transported to the proposed development site (also as abnormal loads). The distance from Johannesburg to the Phala SPP is approximately 162 km, via the N1.

4.4 HAULAGE OF OTHER CONSTRUCTION MATERIALS, EQUIPMENT AND PERSONNEL

It is assumed that cement will be sourced from local manufacturers within the towns of Bela-Bela and Modimolle. All other civil construction materials, needed for concrete and wearing course, will be obtained commercially. Furthermore, it is anticipated that construction personnel and labour would originate from the neighbouring towns such as Bela-Bela and Modimolle (as well as the smaller villages located within a maximum 50 km radius such as Ngobi, Swartboom, etc.). These trips are classified as local trips as vehicles will not be travelling over a (comparably) long distance.

4.5 ROUTE CLEARANCE

It is anticipated that some route clearing may be needed with certain portions of the route already cleared for other renewable energy projects. In addition, temporary widening of intersections along the route may also be required in order to simplify the turning movements of the abnormal load vehicles.

The vehicles used to transport the photovoltaic (PV) equipment are standard container trucks and not abnormal load vehicles. No obstacles (e.g. low overhead services, cattle grids, narrow bridges, etc.) are expected, as these routes are travelled by the same type of vehicle throughout.

4.6 LEGISLATION AND PERMIT REQUIREMENTS

The overarching environmental legislation for management environmental management in South Africa, is the *National Environmental Management Act*, 1998 (Act 107 of 1998 "NEMA"). The foreword of this document states that sustainable development requires the integration of social, economic, and environmental factors in the planning, implementation and evaluation of environmental decisions to ensure that the development serves present and future generations. Traffic impacts are therefore an important aspect to consider in the decision-making process of developments.

4.6.1 Roads

The relevant legislation associated to the road (infrastructure), transportation and traffic include, inter alia:

- *National Water Act* (Act 36 of 1998), with regards to all crossings of water courses;
- *National Road Traffic Act* (Act 93 of 1996);
- *Advertising on Road and Ribbon Development Act* (Act 21 of 1940), particularly:
  - Section 9: Prohibition of erection of structures or construction of other things near intersections of certain roads; and
  - Section 10: Restriction of access to land through fence along certain roads.
- *Roads Ordinance Act* (Act 19 of 1976), particularly:
  - Section 13: Erection of gates across public roads and public paths;
  - Section 17: Erection of structures on or near public roads; and
  - Section 18: Access to and exit from certain public roads and public paths.

4.6.2 Vehicle dimensions

In terms of vehicle dimensions, the relevant rules are defined in Regulations 221 to 230 of the *National Road Traffic Act*. The most important of these are summarised below:

- Regulation 221: Defines the legislation requirements regarding the overall length of vehicles. The following lengths shall not be exceeded:
  - Rigid vehicle: 12.5 m;
  - Articulated vehicle and semi-trailer: 18.5 m; and
  - Combination vehicle (interlinks, multiple trailers etc.): 22.0 m
- Regulation 223: Defines the legislation requirements regarding the overall width of vehicles. Vehicles with a gross mass of 12 000 kg or more, shall not exceed 2.6 m.
- Regulation 224: Define the legislation requirements regarding the overall height of a vehicle and transported load, which shall not exceed 4.3 m.

- Regulation 225: Defines the legislation requirements regarding the maximum turning radius and wheelbase, which shall not exceed 13.1 m or 10.0 m (semi-trailer) respectively.

4.6.3 Vehicle loads

In relation of vehicle loads, applicable rules are stipulated in Regulations 231 to 249 of the *National Road Traffic Act*. The most pertinent of these are provided below:

- Regulation 240: Defines the legislation requirements regarding the mass load carrying on roads.
- Regulation 241: Defines the legislation requirements regarding the mass load carrying capacity of bridges.

4.6.4 Abnormal load considerations

The *National Road Traffic Act* (Act 93 of 1996) and *the National Road Traffic Regulations* (2000) prescribed certain limitations on vehicle dimensions and axle and vehicle masses that vehicles using a public road must comply with. Loads are therefore classified as an abnormal load in cases where these prescribed limitations are exceeded. Provision for such abnormal vehicles and loads are made in Section 81 of the *National Road Traffic Act*, as substituted by Section 23 of the *National Road Traffic Amendment Act* (Act 64 of 2008).

The requirements and procedures for transporting of abnormal loads are contained in the following two documents: (1) *TRH 11: Dimensional and Mass Limitations and Other Requirements for Abnormal Load Vehicles*; and (2) *Administrative Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads*.

The specific permits and consents that may be required from the relevant authorities, for the transportation of abnormal loads, are summarised in *Table 4.4* below.

Table 4.4: Permits and consent requirements

PERMIT / CONSENT TYPE	RELEVANT AUTHORITY	STRATEGY
Abnormal Load / Vehicle Permit in terms of *National Road Traffic Act* (93 of 1996), Section 81	Limpopo Provincial Government: Department of Transport and Community Affairs & KwaZulu-Natal Provincial Government: Department of Transport	The contractor will obtain the necessary road transportation permits.
The South African National Roads Agency Limited and *National Roads Act* (Act 7 of 1998)	South African National Roads Agency SOC Limited (SANRAL): *Northern Region*	The contractor will obtain clearance from *SANRAL*.

CHAPTER 5 BACKGROUND TRAFFIC VOLUMES

5.1 INTRODUCTION

Background traffic volumes from various traffic recording stations located on major roadways and major transportation routes were identified and acquired from *Mikros Traffic Monitoring (Pty) Ltd*. These traffic volumes serve to establish the status quo traffic conditions and historic traffic trends.

Though some of the traffic data obtained for specific stations contained information from the past 2 years (i.e., January 2020 to August 2022), this data was not used as it is assumed that traffic volumes were influenced by the COVID-19 pandemic and prevailing lockdown travel restrictions that were imposed. As such, a trendline analysis of the historic data was applied to determine background traffic. The resulting level of service (LOS) of these roads for the existing background traffic (2022) and calculated future background traffic (2026) scenarios was calculated (i.e., excluding trips estimated to be generated by the Phala SPP).

5.2 TRAFFIC RECORDING STATION DATA

The locations of suitable traffic recording stations were identified along the preferred (i.e., shortest) route and only from the Port of Durban. A summary of the traffic recording stations is provided in the table below and an overview is provided in *Figure 5.1*.

Table 5.1: Traffic recording stations (Port of Durban route)

SITE IDENTIFIER	LOCATION	ROUTE	NO. OF LANES	2019 AVERAGE DAILY TRAFFIC (ADT)	2019 AVERAGE DAILY TRUCK TRAFFIC (ADTT) (% OF ADT)
1990 - Estcourt I/C	Southern side of Giants Castle I/C	N3	6	17 611	7 487 (42.5%)
3024 - N3TC Harrismith WIM	Between Harrismith and Warden	N3	4	12 542	4 833 (38.5%)
1591 - Grootvlei I/C	Southern side of Grootvlei I/C	N3	6	12 594	4 247 (34%)
349 - Leondale	Between Leondale I/C and Heidelberg Rd I/C	N3	4	52 762	5 290 (10%)
1625 - Bakwena Murrayhill	Northern side of Murrayhill I/C	N1	6	26 461	5 350 (20.2%)
670 - Settlers I/C	Southern Side of R567 Settlers I/C	N1	6	21 741	4 248 (19.5%)
1133 - Pienaarsrivier R101	Between Maubane and Pienaarsrivier	R101	2	7 637	744 (9.7%)

It should be noted that the traffic recording station 1133 is not specifically located on the preferred (i.e., shortest) route from the Port of Durban. This station is located on the R101, adjacent to the N1 and was included as it can give an indication of vehicle volumes travelling past the proposed site location (i.e., local traffic volumes).

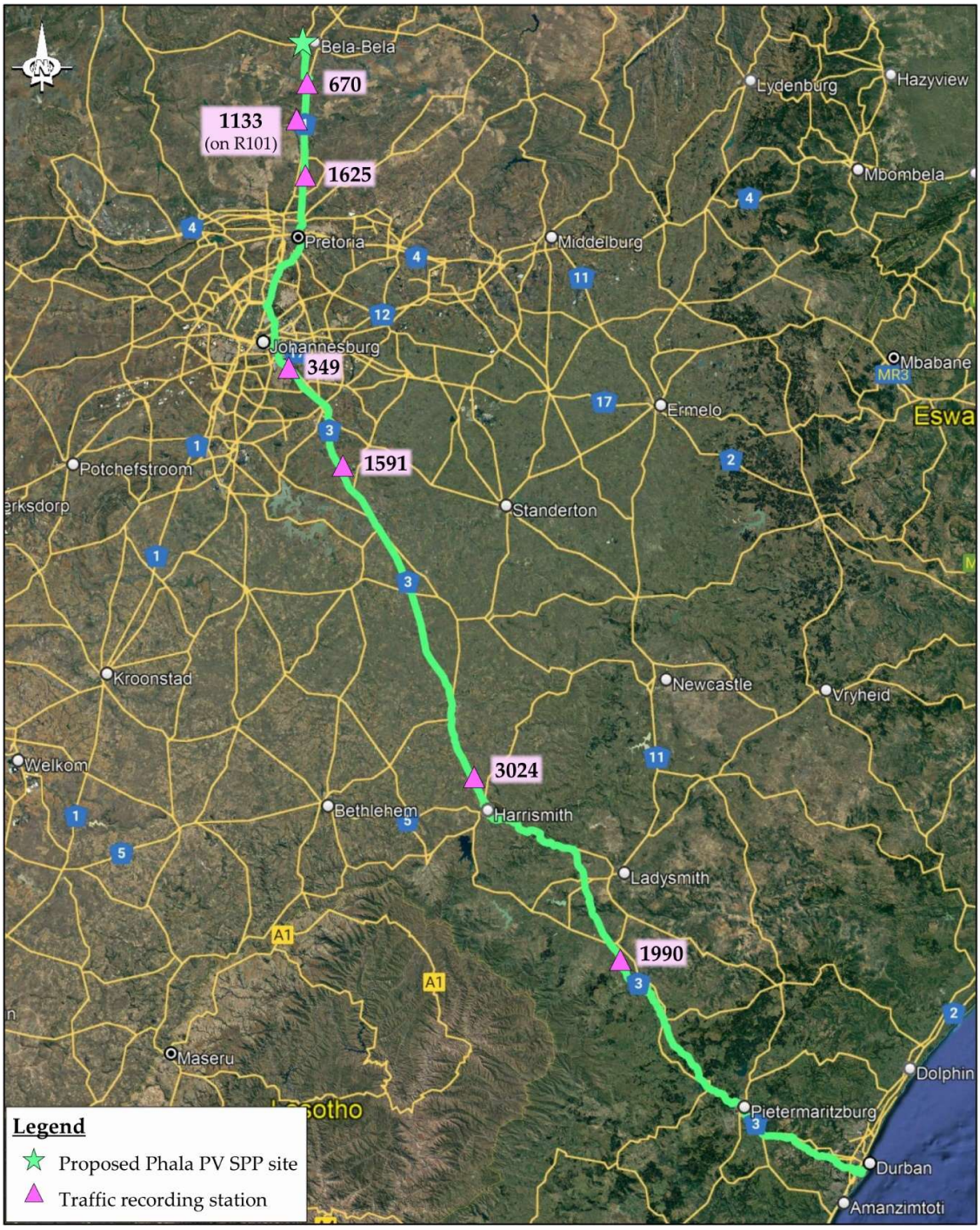


Figure 5.1: Overview of traffic recording station locations

The ADT recorded along the preferred route therefore comprises between 10% and 43% truck traffic, with the highest proportion of truck traffic recorded just north of Estcourt (traffic recording station located furthest from proposed site). The lowest proportion of truck traffic was recorded at the traffic recording station closest to the proposed development site.

It is also noted that some of these stations are located close to the urban districts and indicate high daily volumes in the records.

5.3 CAPACITY ANALYSIS SUMMARY

The *TRH 17* document was consulted to determine whether the capacity of the above-mentioned roadways will be exceeded within the construction horizon period (2026). A summary of the estimated LOS for investigated road sections is provided in *Table 5.2* below***Error! Reference source not found.***.

Table 5.2: Capacity analysis (background traffic)

SITE IDENTIFIER	ROUTE	2022 ADT (vpd)	2022 LEVEL OF SERVICE (LOS)	2026 ADT (vpd)	2026 LEVEL OF SERVICE (LOS)
REGIONAL TRAFFIC – DURBAN ROUTE					
1990*	N3	17 105	B	17 105	B
3024*	N3	12 382	A	12 382	A
1591*	N3	12 594	A	12 594	A
349**	**N3**	**53 822**	**E**	**56 007**	**E**
1625**	N1	26 993	C	28 993	C
LOCAL TRAFFIC					
670**	N1	22 178	C	23 079	C
1133**	R101	7 790	D	8 106	D

The stations SITE ID 1990, 1591, 1625 and 670 consist of three lanes in each direction. LOS assessed as 4-lane freeway.

*Trendline indicated negative growth. Zero change in traffic was therefore selected instead of decreased traffic.

**No historic information available; 2019 data extrapolated with 1%

It is noted that while historic data (prior to 2019) was available for SITE ID 1990, 3024 and 1591 at the time of the assessment, only data for 2019 was available for SITE ID 349, 1625, 670 and 1133. The growth for the forecast was assumed as 1%.

The low level of service at Station 349 is expected due to the location of the site. This is in an urban environment where high volumes are expected. The station is already at a low level of service, without the impact of the development and the low level of service calculated is not due to the proposed development. The trips generated by the proposed development and the impact they would have on the road network are assessed in the following chapter.

CHAPTER 6 TRIP GENERATION

The proposed Phala SPP site will generate additional traffic on the surrounding road network in three distinct phases, namely: (i.) construction, (ii.) operational and (iii.) decommissioning phases. It should be noted that the three phases will generate traffic consecutively and not simultaneously, and therefore will be considered separately from one another.

6.1 CONSTRUCTION PHASE

Trips generated during the construction phase will primarily comprise the transportation of: equipment, power plant components, personnel, construction and other facility materials. These trips will consist of normal, medium and heavy vehicles. The number of new vehicle trips estimated to be generated during the construction phase of the proposed project are based on the following assumptions:

- The construction period is estimated as two years, comprising an average of 22 working days per month. This results in approximately 500 working days over the duration of the construction period (considering provision for builders' holidays).
- The proposed Phala SPP will be constructed from components shipped to South Africa via the Port of Durban. These components will be transported to site via road transport using medium and heavy vehicles.
    - The solar power plant will have a maximum generation capacity of 350 MW.
    - Approximately 800 000 PV modules of approximately 300 – 550 W each will be delivered to site. Approximately 660 of these 300 – 550 W units can fit into one (1) container (30 units per pallet; 22 pallets per container). This results in approximately 1210 container loads in total being delivered to site..
- Other plant, materials and equipment will be sourced from the nearest towns. An average of 200 -300 trips per 7 MW is assumed. For this site, this has been assumed to be 40 trips per MW. This results in approximately 14 000 trips over the 24-month construction period.

In addition to haulage-related trips, it is noted that new vehicle trips will also be generated by the daily movement of (site) workers. The following assumptions were made in this regard:

- The construction labour force will primarily originate from the inhabited areas immediately surrounding the proposed site: Bela-Bela, Modimolle and the surrounding villages of Ngobi, Swartboom, etc.
- Approximately 350 staff members will be on-site.
    - Based on the composition of the labour force and personnel requirements, it is assumed that 10% of the staff members will make use of private or company

vehicles (cars and LDVs). These staff members will travel from their permanent or temporary residences to site on a daily basis.

- The remaining staff (90%) will be transported to site by way of 15-seater minibus-taxis. The quantity of these vehicles will fluctuate, depending on the number of staff requirement transport, associated costs, routes and operating hours.

The table below summarises the estimated total trips that will be generated during the construction phase of the project:

Table 6.1: Trip generation (construction phase)

TRANSPORT TYPE	PARAMETER	AVERAGE DAILY TRAFFIC	MONTHLY TRAFFIC	TOTAL TRIPS (2yrs)
Normal heavy load (solar panels)	660 panels per container	3	55	1210
Normal heavy load (construction materials)	40 trips/MW	28	616	14 000
LDVs and cars (Staff)	350 staff	56	1 232	28 000
TOTAL TRIPS FOR CONSTRUCTION PERIOD		**87**	**1 903**	**43 210**

It can be seen from the table above that the construction phase of Phala SPP will generate approximately **43 210** trips over the two-year period.

6.2 OPERATIONAL PHASE

The following assumptions were made with regards to the trip generation taking place during the operational phase of the proposed Phala SPP.

- The proposed Phala SPP will be operational for a period of 20 to 30 years.
- Operations at the SPP will take place on all seven days of the week and personnel will therefore be required to operate in shifts.
- The operational team will consist of approximately 50 people.

The traffic impact during the operational phase will therefore be insignificant, as approximately only fifty (50) people will work at the solar power plant on a shift work basis.

6.3 DECOMMISSIONING PHASE

The decommissioning phase will commence at the end of the Phala SPP lifespan (20 to 30 years) and will last approximately six months. This phase will involve a team of fifty workers. As per the operational phase, associated traffic impacts are therefore considered insignificant.

CHAPTER 7 TRAFFIC IMPACT ANALYSIS

7.1 OVERVIEW

The expected effects of traffic that would be generated by the proposed Phala SPP site analysed as follows:

- Background traffic volumes were determined for the study network near the site, as well as along the transportation routes.
- The existing traffic volumes for the years 2020 to 2026 were predicted and were based on trendline analyses or annual escalation as indicated.
- Construction phase traffic (site-generated trips) were estimated for the proposed solar power plant.
- The construction phase traffic is then added to the 2026 background traffic volumes to determine the total traffic conditions with the solar power plant completed.

The sub-chapters below provide the impact the development of the solar power plant will have on the transportation routes and local traffic respectively.

7.2 ASSESSMENT OF IMPACTS ON REGIONAL TRANSPORTATION ROUTE

The trips generated by this development were evaluated in relation to the number of trips needed to change the Level of Service (LOS) on a portion of the rural highway and the ultimate capacity of two-lane highways.

As discussed in *CHAPTER 6*, the traffic impact of the delivery and construction trips on the Durban route is minimal, with average additional traffic of 3 trips per day from the ports of entry over the duration of the project, and 28 trips per day for normal heavy vehicles for construction materials.

These construction trips will be insignificant when compared to the Average Daily Traffic (ADT) and will not affect the existing Level of Service (LOS). This estimated increase in ADT volumes is similar to other variations in ADT volumes that are typically caused by certain "seasonal" effects (e.g., day-of-week, month-of-year, etc.). The impact that this additional traffic will have on the existing LOS (along the identified road sections) is therefore considered insignificant. It can therefore be concluded that, in terms of estimated traffic volumes, no mitigation measures will be necessary along the regional routes due to the proposed development.

It is acknowledged that the results of the above assessment are only linked to vehicle trips generated by the proposed Phala SPP. There are, however, other similar projects that are located within close proximity (30 km) to the proposed site and may be constructed over the

same period. The ultimate scenario for the cumulative impact of these facilities must therefore be considered and this is addressed in *Chapter 8*.

7.3 ASSESSMENT OF IMPACTS ON LOCAL TRAFFIC

The available traffic count data indicates that the level of service of routes in close proximity to the site at SITE IDs 670 and 1133 would be unchanged between the current date and the horizon year, 2026, performing at a LOS C and D respectively. The impact that new worker trips, estimated to be generated during the construction phase of the proposed project, will have on local traffic operations is summarised in *Table 7.1*.

Table 7.1: Local traffic impact (worker trips)

SITE ID	ROUTE		2026 ADT VOLUME	NEW WORKER TRIPS	2026 TOTAL ADT VOLUME	2026 LEVEL OF SERVICE (LOS)
670	N1	All traffic	23 079	56	23 135	C
1133	R101	All traffic	8 106	56	8 162	D

This expected increase in traffic volumes (resulting from worker-generated trips during the construction phase) will not have a significant impact on the operation of the local road network. The existing road section has capacity to accommodate these new vehicle trips; minimal mitigation measures such as staggered trips may be required.

7.4 SUMMARY

The traffic stations used in the analysis indicate that urban regional routes are performing at a marginal level of service. This, however, is not due to the proposed development.

The analysis indicates that further traffic investigations may be required in close proximity to the site. This is due to the high volumes of traffic along the R101, which indicate that acceleration/deceleration lanes may be required for implementation at the site access.

CHAPTER 8 CUMULATIVE IMPACT ASSESSMENT

8.1 OVERVIEW

The EIA Regulations (as amended in 2017) determine that cumulative impacts, "*in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities*." The cumulative impact of the proposed development has been assessed in terms of the cumulative impact of the implementation of the Phala SPP together with similar solar farm developments within a 30 km radius.

8.2 CUMULATIVE IMPACT – SOLAR FARM DEVELOPMENTS IN 30KM RADIUS

Table 7.2 below provides a summary of other renewable energy projects that have been identified for the cumulative impact assessment, within a 30 km radius from the development site. The premise for the assessment is that these projects would be constructed during the same period as the Phala SPP. While this is unlikely, all these projects are included in the cumulative trip generation and subsequently the cumulative impact assessment.

The construction trips for Phala SPP, as presented in *Chapter 6.1*, are presented below for ease of reference:

Table 8.1: Summary of construction trips for Phala SPP

TRANSPORT TYPE	AVERAGE DAILY TRAFFIC	PROPORTION (%)
Regional traffic - Normal heavy load (solar panels)	3	3%
Regional traffic - Normal heavy load (construction materials)	28	32%
Local traffic - LDVs and cars (Staff)	56	65%
TOTAL TRIPS FOR CONSTRUCTION PERIOD	87	**100%**

The expected trip generation presented in the following table has been based on the proportional number of PV panels requiring transport from a port of entry, and therefore the number of trips, in comparison to the design MW capacity of the Phala SPP.

Table 8.2: Additional solar power projects (within 30 km radius from study area)

NO.	PROJECT NAME	DISTANCE FROM STUDY AREA (km)	CAPACITY (MW)	EXPECTED TOTAL DAILY CONSTRUCTION TRIPS
1	Portion 67 of Tweefontein Farm 462 KR	9km	30 MW	5
2	Gihon Solar Energy Facility	0km	75 MW	13
3	Portion 67 of Tweefontein Farm 462 KR	9km	75 MW	13
TOTAL CUMULATIVE DAILY TRIPS OVER CONSTRUCTION PERIOD				**31**

The cumulative power-generating capacity of these 3 similar potential projects is 180 MW. This equates to approximately 50% of the power-generating capacity of the Phala SPP (350 MW). Consequently, it is anticipated that the increase in haulage-related vehicle trips generated during the construction phase of these projects will be of a similar proportion.

Due to the long distances (and distances between the traffic recording stations) associated with these trips it is further assumed that all similar projects will use the same haulage route as recommended in this study. This is considered overestimation of volumes and therefore represents the "worst-case" scenario.

This cumulative value is deemed to be a low negative impact on the regional routes. This cumulative impact is considered in the overall impact assessment in *CHAPTER 9* overleaf.

CHAPTER 9 IMPACT ASSESSMENT SUMMARY

9.1 OVERVIEW

The impact of the proposed development has been assessed in terms of traffic as shown below for the environmental impact reporting requirements. The traffic impact of the proposed development is presented in terms of the assessment methodology described in *Appendix C* of this report.

9.2 IMPACT ASSESSMENT – CONSTRUCTION PHASE REGIONAL TRAFFIC

In terms of traffic and transport, the impact that the proposed development will have during the construction phase is as follows:

Table 9.1: Impact assessment – construction phase regional traffic

CRITERIA	DESCRIPTION AND/OR RATING
Nature	Increased traffic on regional haulage routes: The haulage routes for light and heavy vehicles include regional routes that would be impacted by the construction of the development. The delivery of imported construction materials to site would likely originate from Johannesburg and Durban Harbour, as discussed in the preceding chapters, slightly increasing the average daily traffic of the routes used over the construction period.
Geographical Extent	The regional traffic will affect routes from the ports of entry, which fall outside the development area's location, the Limpopo Province, which therefore requires interprovincial travel. The impact is therefore classified as "National". *Rating – 4*
Probability	The solar equipment cannot be transported without the regional trips. The impact is therefore classified as "Definite". *Rating – 4*
Duration	The duration of the construction of the solar power plant is estimated to be two years, with the transporting of equipment along regional routes occurring in less than the two-year period. The impact is therefore classified as "Short term". *Rating – 1*
Intensity / Magnitude	The average daily regional traffic added to the regional road network due to the construction of the Phala SPP is barely perceptible in relation to the general traffic expected on those routes. The impact is therefore classified as "Low". *Rating – 1*
Reversibility	The transport of equipment/material along the regional routes for the construction phase will cease after the construction period. The impact is therefore classified as "Completely reversible".

<table>
<tr><th>CRITERIA</th><th>DESCRIPTION AND/OR RATING</th></tr>
<tr><td></td><td>Rating – 1</td></tr>
<tr><td>Irreplaceable Loss of Resources</td><td>No irreplaceable loss of resources will occur due to the regional traffic. The impact is therefore classified as “No Loss”.
Rating – 1</td></tr>
<tr><td>Cumulative Effect</td><td>There is a small possibility that one additional solar plant will be constructed over the same period. This will have moderate to minor cumulative effects on the existing traffic volumes. The impact is therefore classified as “Low cumulative”.
Rating – 2</td></tr>
<tr><td>Significance
The calculation of the significance of an impact uses the following formula:
(Extent + probability + duration
+ reversibility
+ irreplaceability
+ cumulative effect)
x magnitude/intensity.</td><td>Therefore, the Impact Significance Rating = 13
<table><tr><th>Points</th><th>Impact significance rating</th><th>Description</th></tr><tr><td>6 to 28</td><td>Negative low impact</td><td>The anticipated impact will have negligible negative effects and will require little to no mitigation.</td></tr></table></td></tr>
<tr><td>Possible Mitigation Measures</td><td>The impact of the increased traffic on regional routes can be mitigated by staggering trips and scheduling so that peak hour traffic in local towns is not impacted by construction traffic.</td></tr>
<tr><td>Post-mitigation Rating</td><td>Negative low impact</td></tr>
</table>

9.3 IMPACT ASSESSMENT – CONSTRUCTION PHASE LOCAL TRAFFIC

Table 9.2: Impact assessment – construction phase local traffic

CRITERIA	DESCRIPTION AND/OR RATING
Nature	<u>Increased traffic on local routes:</u> The road network, surrounding the proposed Phala SPP site, will be affected. There will be an increase in traffic influencing traffic congestion and road safety. The extent of the road network that will be affected is small, as staff will be living in neighbouring towns, i.e., Bela-Bela, Modimolle and even the surrounding villages e.g., Ngobi, Swartboom, etc. In general, approximately only 10% of daily traffic could be attributed to peak hour volumes. This would only be slightly noticeable if construction traffic passes through the local town during peak periods.
Geographical Extent	The local traffic will affect routes from surrounding towns. The impact is therefore classified as “Local”. *Rating – 2*
Probability	The transport of staff during construction will likely impact the local traffic, depending on the various locations staff are sourced from. The impact is therefore classified as “Probable”. *Rating – 3*

<table>
<tr><th>CRITERIA</th><th>DESCRIPTION AND/OR RATING</th></tr>
<tr><td>Duration</td><td>The duration of the construction of the solar power plant is estimated to be two years, with the increased local traffic occurring over that period. The impact is therefore classified as “Short term”.
Rating – 1</td></tr>
<tr><td>Intensity / Magnitude</td><td>The average daily local traffic added to the local road network due to the construction of the Phala SPP is barely perceptible in relation to the general traffic expected on those routes. The additional impact is therefore classified as “Low”.
Rating – 1</td></tr>
<tr><td>Reversibility</td><td>The increased local traffic for the construction phase will cease after the construction period. The impact is therefore classified as “Completely reversible”.
Rating – 1</td></tr>
<tr><td>Irreplaceable Loss of Resources</td><td>No irreplaceable loss of resources will occur due to the local traffic. The impact is therefore classified as “No Loss”.
Rating – 1</td></tr>
<tr><td>Cumulative Effect</td><td>There is a small possibility that the additional solar plant may be constructed over the same period. This may have moderate to minor cumulative effects on the existing traffic volumes. The impact is therefore classified as “Medium cumulative”.
Rating – 3</td></tr>
<tr><td>Significance
The calculation of the significance of an impact uses the following formula:
(Extent + probability + duration
+ reversibility
+ irreplaceability
+ cumulative effect)
x magnitude/intensity.</td><td>Therefore, the Impact Significance Rating = 11

<table><tr><th>Points</th><th>Impact significance rating</th><th>Description</th></tr><tr><td>6 to 28</td><td>Negative low impact</td><td>The anticipated impact will have negligible negative effects and will require little to no mitigation.</td></tr></table></td></tr>
<tr><td>Possible Mitigation Measures</td><td>The impact of the increased traffic on local routes can be mitigated by staggering trips and scheduling so that peak hour traffic in local towns is not impacted by construction traffic. Providing acceleration/deceleration lanes at the proposed access may assist with safety at the site access intersection.</td></tr>
<tr><td>Post-mitigation Rating</td><td>Negative low impact</td></tr>
</table>

9.4 IMPACT ASSESSMENT – CONSTRUCTION PHASE SITE ROADS INFRASTRUCTURE

Table 9.3: Impact assessment – construction phase site roads infrastructure

CRITERIA	DESCRIPTION AND/OR RATING
Nature	Construction and maintenance of gravel roads in vicinity of the site: The construction traffic accessing the site would be traveling along roads that are proposed to be unsurfaced for the development. The movement of heavy vehicles along the gravel roads, especially close to the boundaries of the site, may cause excessive dust in the area. Deterioration of gravel roads may also occur after wet seasons, leading to poor road conditions for transportation on site.
Geographical Extent	The gravel roads affected will be those on site. The impact is therefore classified as "Local". *Rating – 2*
Probability	The deterioration of the gravel roads is likely, with the constant use during the construction period. The impact is therefore classified as "Probable". *Rating – 3*
Duration	The duration of the construction of the solar power plant is estimated to be two years, with the construction traffic occurring over that period. The impact is therefore classified as "Short term". *Rating – 1*
Intensity/ Magnitude	The average daily construction traffic of 61 vehicles per day is considered a low volume for a gravel road. The impact is therefore classified as "Low". *Rating – 1*
Reversibility	The traffic for the construction phase will cease after the construction period. The condition of the road is expected to have slight deterioration, compared to a newly constructed gravel road but a maintenance schedule will control the rate of deterioration. The impact is therefore classified as "Partly reversible". *Rating – 2*
Irreplaceable Loss of Resources	Marginal irreplaceable loss of resources may occur due to poor quality site roads. The impact is therefore classified as "Marginal Loss". *Rating – 2*
Cumulative Effect	There is a small possibility that surrounding properties may also need to use the gravel access roads, to a certain point. This may have insignificant cumulative effects on the condition of the road. The impact is therefore classified as "Low cumulative". *Rating – 2*

<table>
<tr><th>CRITERIA</th><th>DESCRIPTION AND/OR RATING</th></tr>
<tr><td>Significance
The calculation of the significance of an impact uses the following formula:
(Extent + probability + duration
+ reversibility
+ irreplaceability
+ cumulative effect)
x magnitude/intensity.</td><td>Therefore, the Impact Significance Rating = 12

<table><tr><th>Points</th><th>Impact significance rating</th><th>Description</th></tr><tr><td>6 to 28</td><td>Negative low impact</td><td>The anticipated impact will have negligible negative effects and will require little to no mitigation.</td></tr></table></td></tr>
<tr><td>Possible Mitigation Measures</td><td>Maintenance to lower order roads can be incorporated into the schedule, especially the maintenance of the road accessing the site. The site access road would require construction at the start of the construction project, in order to safely transport the sensitive cargo through the site. A gravel roads maintenance programme for the gravel roads on site is recommended.</td></tr>
<tr><td>Post-mitigation Rating</td><td>Negative low impact</td></tr>
</table>

9.5 IMPACT ASSESSMENT – OPERATIONAL PHASE TRAFFIC

Table 9.4: Impact assessment – operational phase traffic

CRITERIA	DESCRIPTION AND/OR RATING
Nature	<u>Increased traffic during operational phase:</u> The traffic will increase slightly, in comparison to traffic without the development, due to the employees on site during the operational phase.
Geographical Extent	Depending on staff/vendor origin, the operational phase traffic will affect routes in surrounding towns. The impact is therefore classified as "Local". *Rating – 2*
Probability	Increase in traffic during operational phase may occur. The impact is therefore classified as "Possible". *Rating – 3*
Duration	The duration of the operational phase of the solar power plant is estimated to be 20 – 30 years. The impact is therefore classified as "Long term". *Rating – 3*
Intensity/ Magnitude	The traffic expected on site during the operational phase is barely perceptible. The impact is therefore classified as "Low". *Rating – 1*
Reversibility	The operational phase traffic volumes will no longer be required once the facility reaches the end of its life. The impact is therefore classified as "Completely reversible". *Rating – 1*
Irreplaceable Loss of Resources	No irreplaceable loss of resources will occur due to the operational traffic. The impact is therefore classified as "No Loss". *Rating – 1*

<table>
<tr><th>CRITERIA</th><th>DESCRIPTION AND/OR RATING</th></tr>
<tr><td>Cumulative Effect</td><td>There is a small possibility that surrounding similar projects may also be operational at the same time. Operational traffic is minimal; this may have negligible cumulative effects on the cumulative traffic on the local road (N1). The impact is therefore classified as “Negligible cumulative”.
Rating – 1</td></tr>
<tr><td>Significance
The calculation of the significance of an impact uses the following formula:
(Extent + probability + duration
+ reversibility
+ irreplaceability
+ cumulative effect)
x magnitude/intensity.</td><td>Therefore, the Impact Significance Rating = 11
<table>
<tr><th>Points</th><th>Impact significance rating</th><th>Description</th></tr>
<tr><td>6 to 28</td><td>Negative low impact</td><td>The anticipated impact will have negligible negative effects and will require little to no mitigation.</td></tr>
</table></td></tr>
<tr><td>Possible Mitigation Measures</td><td>The impact of the increased traffic during the operational phase is negligible due to the expected number of employees. The shift work provides a mitigation and reduces the expected number of employees, especially during peak hours. The magnitude of the increased traffic is relatively small and is not likely to change during the operational phase of the development. These trips will become part of the network trips due to the development. Due to the existing traffic on R101, providing acceleration/deceleration lanes at the proposed access may assist with safety at the site access intersection.</td></tr>
<tr><td>Post-mitigation Rating</td><td>Negative low impact to negligible</td></tr>
</table>

9.6 IMPACT ASSESSMENT – DECOMMISSIONING PHASE TRAFFIC

Table 9.5: Impact assessment – decommissioning phase traffic

CRITERIA	DESCRIPTION AND/OR RATING
Nature	Increased traffic during decommissioning phase: The traffic will increase slightly due to the employees and heavy vehicles on site during the decommissioning phase.
Geographical Extent	The decommissioning phase traffic will affect routes in surrounding towns. The impact is therefore classified as “Local”. *Rating – 2*
Probability	Increase in traffic during decommissioning phase may occur. The impact is therefore classified as “Possible”. *Rating – 3*
Duration	The duration of the decommissioning phase of the solar power plant is estimated to be six months. The impact is therefore classified as “Short term”. *Rating – 1*

<table>
<tr><th>CRITERIA</th><th>DESCRIPTION AND/OR RATING</th></tr>
<tr><td>Intensity/ Magnitude</td><td>The traffic expected on site during the decommissioning phase is barely perceptible. The impact is therefore classified as “Low”.
Rating – 1</td></tr>
<tr><td>Reversibility</td><td>The decommissioning phase traffic volumes will no longer be required once the phase is completed. The impact is therefore classified as “Completely reversible”.
Rating – 1</td></tr>
<tr><td>Irreplaceable Loss of Resources</td><td>No irreplaceable loss of resources will occur due to the decommissioning traffic. The impact is therefore classified as “No Loss”.
Rating – 1</td></tr>
<tr><td>Cumulative Effect</td><td>The impact is classified as “Negligible cumulative”.
Rating – 1</td></tr>
<tr><td>Significance
The calculation of the significance of an impact uses the following formula:
(Extent + probability + duration
+ reversibility
+ irreplaceability
+ cumulative effect)
x magnitude/intensity.</td><td>Therefore, the Impact Significance Rating = 9
<table><tr><th>Points</th><th>Impact significance rating</th><th>Description</th></tr><tr><td>6 to 28</td><td>Negative low impact</td><td>The anticipated impact will have negligible negative effects and will require little to no mitigation.</td></tr></table></td></tr>
<tr><td>Possible Mitigation Measures</td><td>The impact of the increased traffic during the decommissioning phase is negligible due to the expected number of employees and heavy vehicles on site. The magnitude of the increased traffic is relatively small and is not likely to require mitigation measures. The access road at the R36 may require maintenance at the end of the decommissioning phase.</td></tr>
<tr><td>Post-mitigation Rating</td><td>Negative low impact</td></tr>
</table>

9.7 SUMMARY

The above impact assessment is summarised as follows, according to the methodology provided. See *Appendix C* for assessment methodology and additional key.

Table 9.6: Traffic and transport related impact assessment summary

POTENTIAL IMPACT	SIGNIFICANCE AND MAGNITUDE OF POTENTIAL IMPACTS						
DESCRIPTION	MINOR	MAJOR	EXTENT	DURATION	PROBABI-LITY	REVERSIBI-LITY	IRREPLACE-ABLE LOSS
CONSTRUCTION PHASE							
Increased regional traffic	-		(I)	(S)	(D)	(CR)	(NL)
Increased local traffic	-		(L)	(S)	(Pr)	(CR)	(NL)
Site roads infrastructure	-		(L)	(S)	(Pr)	(PR)	(ML)

POTENTIAL IMPACT	SIGNIFICANCE AND MAGNITUDE OF POTENTIAL IMPACTS						
DESCRIPTION	**MINOR**	**MAJOR**	**EXTENT**	**DURATION**	**PROBABI-LITY**	**REVERSIBI-LITY**	**IRREPLACE-ABLE LOSS**
OPERATIONAL PHASE							
Increased traffic	-		(L)	(L)	(Pr)	(CR)	(NL)
DECOMMISSIONING PHASE							
Increased traffic	-		(L)	(S)	(Pr)	(CR)	(NL)

Key:

Extent: (I) International or National; (L) Local or District

Duration: (S) Short-term; (L) Long-term

Probability: (D) Definite; (Pr) Probable

Reversibility: (CR) Completely reversible; (PR) Partly reversible

Loss: (NL) No loss; (ML) Marginal loss

CHAPTER 10 SUMMARY AND CONCLUSIONS

10.1 SUMMARY

The proposed Phala SPP is located on a site approximately 4 km south of Bela-Bela in the Limpopo Province. It will comprise several arrays of PV panels and associated infrastructure and will have a contracted capacity of up to 350 MW. The Phala SPP will be located on the Remaining Extent of Portions 1 and 2 of the Farm Turfbult No. 494, and Portions 5 and 7 of the Farm Turfbult No. 494, covering approximately 570 ha. The infrastructure will include the PV grid with inverters and transformers, BESS, operations and maintenance buildings, internal site roads and electrical grid connection infrastructure.

The site for this development is located off a two-lane surfaced road, R101, which can be classified as a Rural Minor Arterial.

Regional and local transport routes were investigated for the traffic assessment as follows:

- Haulage routes from various ports of entry (Durban Harbour and Richards Bay Harbour) were investigated as regional routes. The regional routes were mainly national routes, with the N3 and N1 considered from Durban Harbour and N2 and N11 considered from Richards Bay Harbour. A regional route from Johannesburg via the N1 has also been assessed and presented for the haulage of major electrical components.
- Routes close to the site, National Route N1 close to the site and the R101 adjacent to the site, were assessed for impact of local trips on the local network.
- The existing traffic volumes on the transportation routes were sourced and used to calculate the current background traffic, the expected background traffic during construction and, thereby, the expected Level of Service. The number of trips generated from the construction period were estimated and the impact of these additional trips on the regional and local transport routes were also investigated.

As part of the cumulative impact assessment, similar solar farm projects within a radius of 30 km were also assessed and the impact assessment reported in terms of the assessment methodology required.

10.2 CONCLUSIONS

The following conclusions were drawn from the study:

- The major traffic impact occurs during the construction phase of the project. The impact of the construction trip generation, on the predicted 2026 (estimated time of construction) traffic volumes on the local and the regional transportation routes are expected to be low. No mitigation measures for these routes will be necessary due to additional development traffic.

- The photovoltaic (PV) components will be delivered to site from the recommended Durban Harbour over a distance of 720 km along the N3 and N1. The regional routes indicated in the analysis would, however, need to be confirmed by freight carriers as suitable for the sensitive normal loads. The final decision on the selected route would be based on a combination of cost, distance and road condition at the time of transport.

- Transformer and substation components will be transported via abnormal loads. An abnormal load will necessitate an application to the *Department of Transport and Public Works* for a permit. A permit is required for each province that the transportation route traverses. Only 1-2 abnormal load trips are expected for Phala SPP. Abnormal load transportation is therefore considered to be isolated and would have a negligible impact on traffic over the construction phase of the project.

- In terms of impact on roads infrastructure:
  - The preferred access point to the site will be via the eastern and western sides of the R101, along the proposed northern site boundary. All other existing accesses (via the R101) to the farms are closed off as part of the propose development of the site. The formalisation of this access point, to the standard, might be a requirement as part of the wayleave approval of the *Limpopo Department: Transport and Community Safety* and/or *South African National Roads Agency Ltd.*
  - Due to the high volumes on R101, it may be required that the access may require acceleration/deceleration lanes.
  - It is proposed that the access roads in close proximity to the site be investigated for rehabilitation prior to construction and be maintained during construction in order to mitigate against the possibility of damaged goods due to poor road infrastructure.
  - The formalisation of the site access point will likely be a requirement as part of the wayleave approval of the local and provincial roads authorities.
  - Adequate traffic accommodation signage must be erected and maintained on either side of the access throughout the construction period of the project.
  - The construction and provision of internal roads that cross the *Eskom* servitude need to be according to *Eskom* wayleave requirements.
  - The construction in the vicinity of and over the existing railway line will also need to adhere to the rail authority's requirements.

- In terms of impact on traffic:
  - The regional construction trips will be insignificant when compared to the existing Average Daily Traffic (ADT) and projected ADT without the development. It has been noted that the N1 and R101 in the region of the site is already at a low level of service, without the addition of the proposed development. Mitigation measures, such as staggered trips and reduced peak time travel are proposed if needed. The layout of the access to the site, at the intersection with the R101 may require

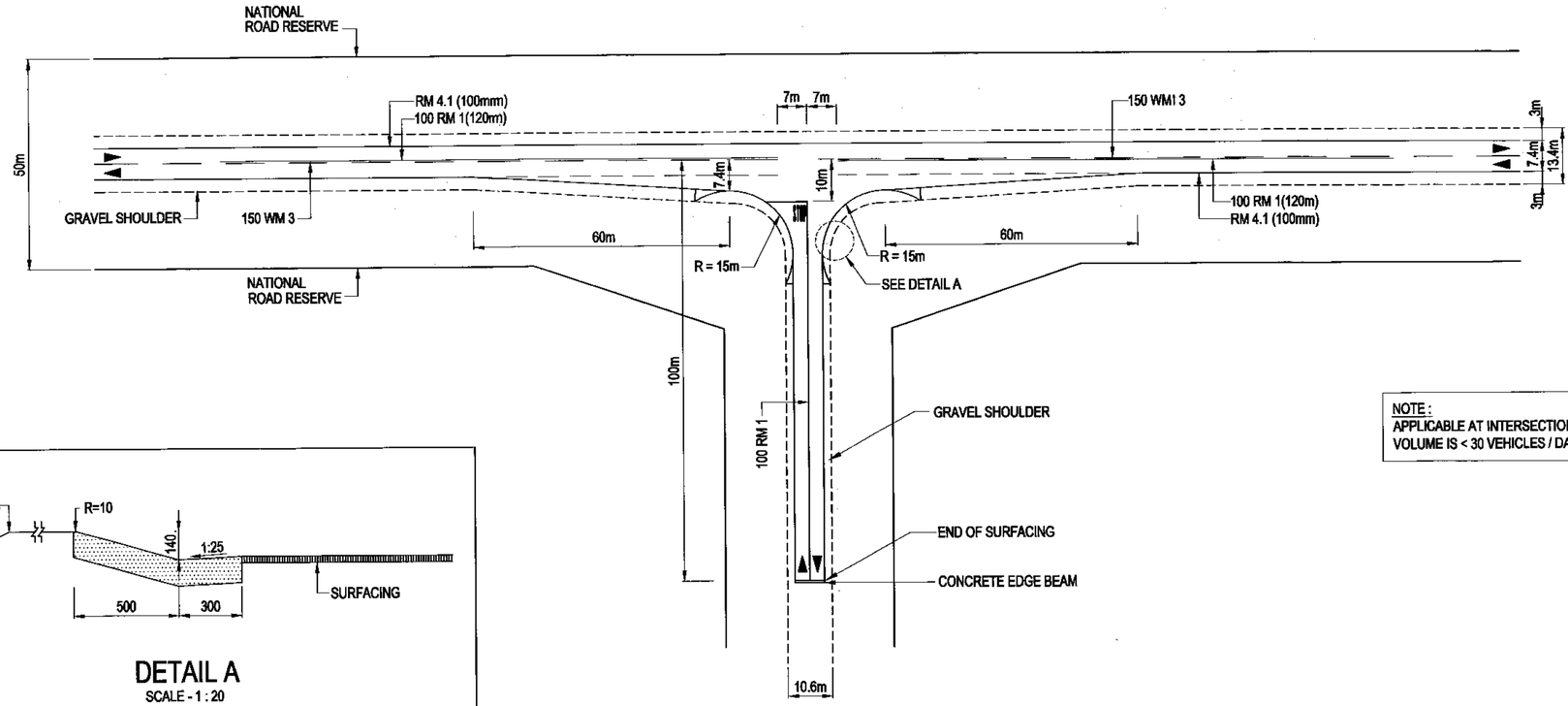
acceleration/deceleration lanes as part of the mitigation due to the high existing traffic.

- In terms of cumulative impact:
  - The concurrent construction of additional solar farms in a 30 km radius of the site has also been considered and is deemed to have a low impact. Mitigation measures that may be considered, should concurrent construction occur, include the staggering of trips at the site and the implementation of a roads maintenance programme.

With the consideration of the recommendations of this report, the development of the Phala SPP, located on the Remaining Extent of Portions 1 and 2 of the Farm Turfbult No. 494, and Portions 5 and 7 of the Farm Turfbult No. 494, Waterberg Local Municipality (Limpopo Province) is supported from a traffic and transportation perspective.

ANNEXURE A:

TYPICAL ACCESS GEOMETRY



ROAD MARKING LEGEND

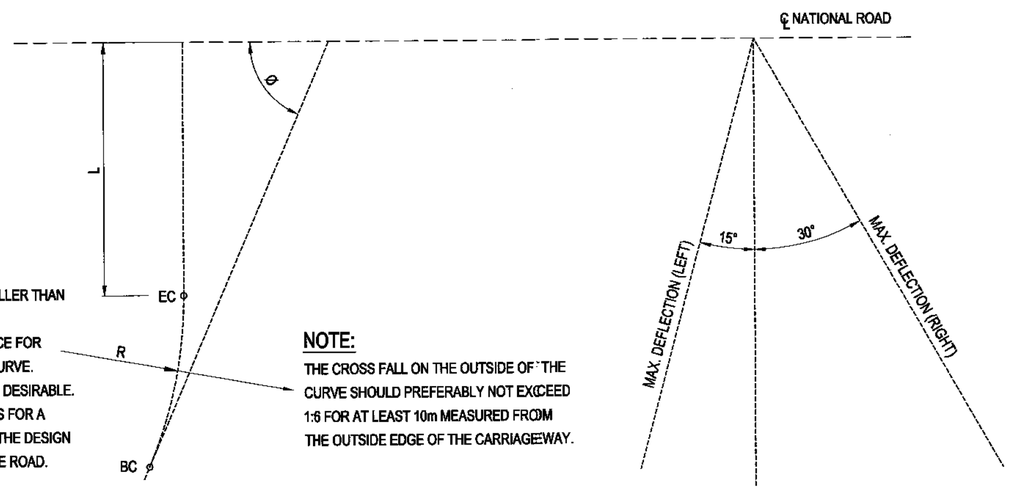
RM 1 = NO OVERTAKING LINE
RM 4.1 = LEFT EDGE LINE
WM 3 = DIVIDING LINE

NOTE :
APPLICABLE AT INTERSECTIONS WHERE THE RIGHT TURNING VOLUME IS < 30 VEHICLES / DAY.

DETAIL A
SCALE - 1 : 20

TABLE 1
SHOULDER SIGHT DISTANCE FOR STOP CONDITIONS

DESIGN SPEED (THROUGH ROAD) (km/h)	SIGHT DISTANCE (D) (m)
50	150
60	180
70	210
80	240
90	270
100	300
110	330
120	360



NOTE

1. Ø = DEFLECTION ANGLE SMALLER THAN SAFE ANGLE.
2. L = STOPPING SIGHT DISTANCE FOR DESIGN SPEED FOR LAST CURVE. MINIMUM LENGTH OF 155m IS DESIRABLE.
3. R = CORRESPONDING RADIUS FOR A SPEED 15km/h LOWER THAN THE DESIGN SPEED FOR THE REST OF THE ROAD.

NOTE:
THE CROSS FALL ON THE OUTSIDE OF THE CURVE SHOULD PREFERABLY NOT EXCEED 1:6 FOR AT LEAST 10m MEASURED FROM THE OUTSIDE EDGE OF THE CARRIAGEWAY.

SAFE ANGLES AND STOPPING SIGHT DISTANCE AT T-JUNCTIONS

SCALE - N.T.S

NOTE:

1. GRADIENT ON BOTH ROADS SHOULD NOT EXCEED 3%, ESPECIALLY ON THE JUNCTION LEG.
2. TABLE 1 CAN BE USED AS A BASIC GUIDELINE ON CONDITION THAT THE GRADIENTS ON BOTH THE JUNCTION AND PRIMARY ROADS DO NOT EXCEED 2%. THE SIGHT DISTANCE MUST BE MEASURED FROM AN EYE LEVEL OF 1,05m FROM A POINT 2m BEFORE THE STOP LINE ON THE JUNCTION ROAD TO AN OBJECT HEIGHT ON THE CENTRE LINE OF THE NATIONAL ROAD OF 1,30m.
3. THE DESIRABLE MINIMUM SIGHT DISTANCE IS 300m.
4. FOR DETAIL OF ROAD MARKINGS REFER TO THE SADC ROAD TRAFFIC SIGNS MANUAL.
5. THIS PLAN SERVES AS A GUIDE LINE AND WELL MOTIVATED DEVIATIONS MAY BE CONSIDERED.
6. WHERE APPLICABLE CROSS-SECTION DIMENSIONS MUST BE ADJUSTED ACCORDING TO THE APPROVED TYPICAL CROSS-SECTION BEING USED.

FOR LATEST VERSION CHECK www.nra.co.za

No.	DATE	VERSION / REVISION	APPROVED
V1	SEPT 2014	ORIGINAL VERSION	

THE SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LTD
Reg. No. 1998/009584/30

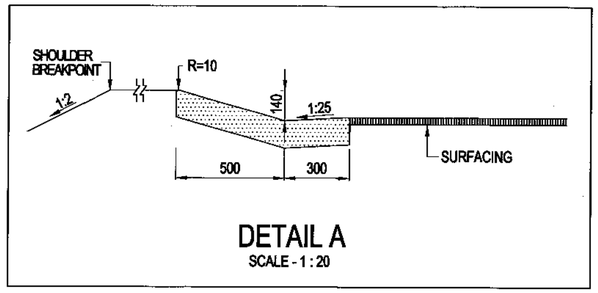
HEAD OFFICE
48 Tambotie Avenue
Val de Grace
Pretoria
0184
PO Box 415
Pretoria 0001
South Africa
Tel: (012) 844 8000

APPROVED
DATE: 2015/06/26

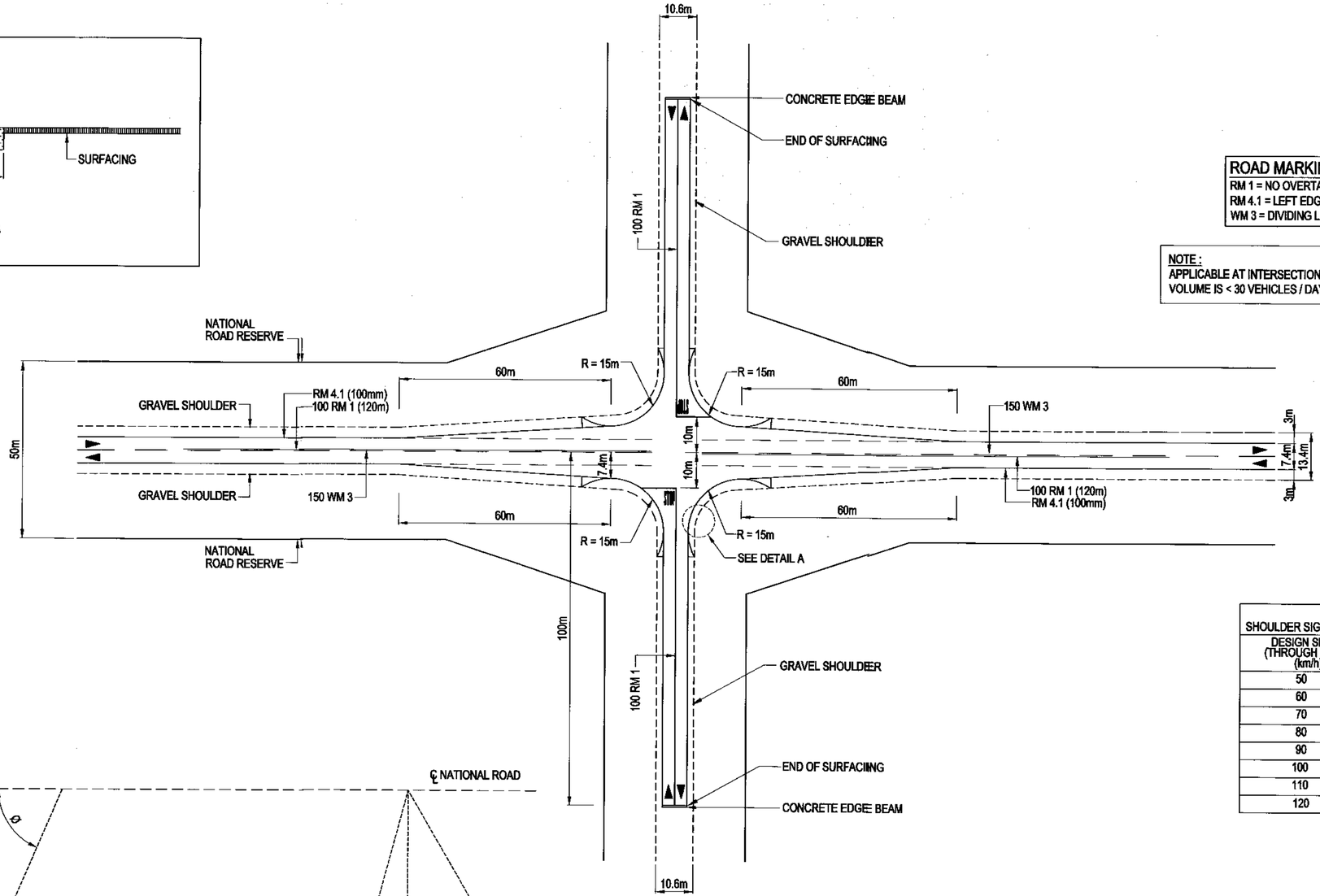
TYPICAL DRAWINGS - ROADWORKS

T - JUNCTIONS & INTERSECTIONS
T - JUNCTION WITH GRAVEL
CLASS 2 ROADS

SANRAL DOC. No. (PDF) 1693224
SANRAL DOC. No. (DWG) 1797268
SANRAL DRAWING No. TD-R-JI-1100-V1



DETAIL A
SCALE - 1 : 20



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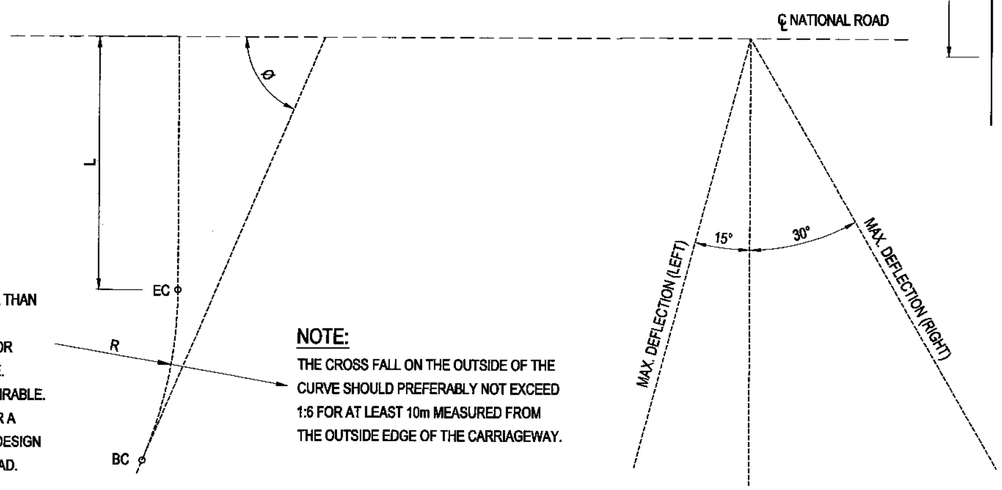

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SAFE ANGLES AND STOPPING SIGHT DISTANCE AT T-JUNCTIONS
SCALE - N.T.S

NOTE:
1. GRADIENT ON BOTH ROADS SHOULD NOT EXCEED 3%, ESPECIALLY ON THE JUNCTION LEG.
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APPROVED
DATE: 2015/06/26

TYPICAL DRAWINGS - ROADWORKS
T - JUNCTIONS & INTERSECTIONS INTERSECTION WITH GRAVEL CLASS 2 ROADS

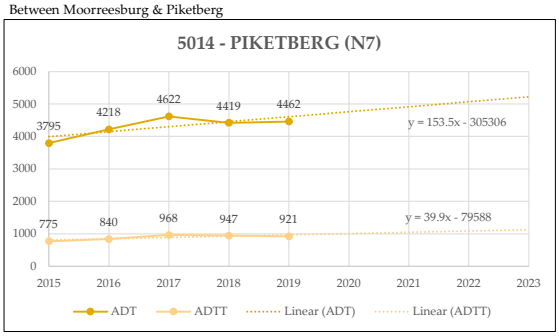
SANRAL DOC. No. (PDF): 1693822
SANRAL DOC. No. (DWG): 1797186
SANRAL DRAWING No.: TD-R-JI-1101-V1

ANNEXURE B:

BACKGROUND TRAFFIC VOLUMES

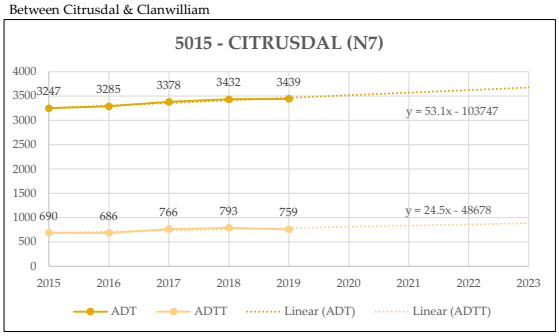
5014 - PIKETBERG (N7)						
YEAR	AVERAGE DAILY TRAFFIC (ADT)			AVERAGE DAILY TRUCK TRAFFIC (ADTT)		
	TO SPRINGBOK	TO CAPE TOWN	TOTAL	TO SPRINGBOK	TO CAPE TOWN	TOTAL
2015	1912	1883	3795	388	387	775
2016	2123	2095	4218	414	426	840
2017	2311	2311	4622	476	492	968
2018	2197	2222	4419	474	473	947
2019	2210	2252	4462	455	466	921
2020	2381	2383	4764	501	508	1009
2021	2458	2460	4918	520	528	1049
2022	**2535**	**2537**	**5071**	**540**	**548**	**1088**
2023	2611	2613	5225	560	568	1128
2024	2688	2690	5378	579	588	1168
2025	2765	2767	5532	599	608	1208
2026	**2842**	**2844**	**5686**	**619**	**628**	**1247**

Between Moorreesburg & Piketberg



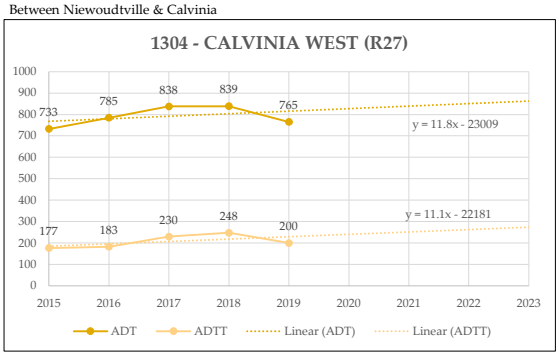
5015 - CITRUSDAL (N7)						
YEAR	AVERAGE DAILY TRAFFIC (ADT)			AVERAGE DAILY TRUCK TRAFFIC (ADTT)		
	TO CLANWILLIAM	TO CITRUSDAL	TOTAL	TO CLANWILLIAM	TO CITRUSDAL	TOTAL
2015	1633	1614	3247	350	340	690
2016	1641	1644	3285	342	344	686
2017	1691	1687	3378	383	383	766
2018	1718	1714	3432	400	393	793
2019	1712	1727	3439	377	382	759
2020	1758	1757	3515	407	405	812
2021	1785	1783	3568	419	417	837
2022	**1811**	**1810**	**3621**	**432**	**429**	**861**
2023	1838	1836	3674	444	442	886
2024	1864	1863	3727	456	454	910
2025	1891	1889	3781	469	466	935
2026	**1918**	**1916**	**3834**	**481**	**478**	**959**

Between Citrusdal & Clanwilliam



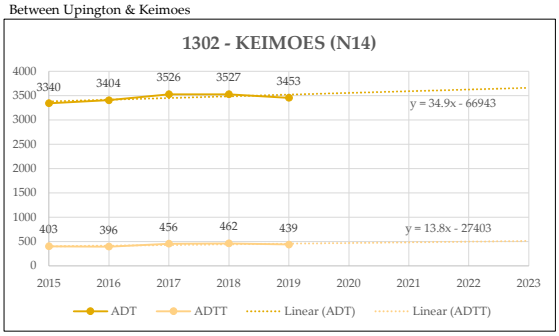
1304 - CALVINIA WEST (R27)						
YEAR	AVERAGE DAILY TRAFFIC (ADT)			AVERAGE DAILY TRUCK TRAFFIC (ADTT)		
	TO CALVINIA	TO NIEUWOUDTVILLE	TOTAL	TO CALVINIA	TO NIEUWOUDTVILLE	TOTAL
2015	373	360	733	93	84	177
2016	397	388	785	96	87	183
2017	425	413	838	120	110	230
2018	428	411	839	131	117	248
2019	390	375	765	106	94	200
2020	420	407	827	127	114	241
2021	426	412	839	133	119	252
2022	**432**	**418**	**851**	**138**	**125**	**263**
2023	438	424	862	144	130	274
2024	444	430	874	150	135	285
2025	450	436	886	156	141	297
2026	**456**	**441**	**898**	**162**	**146**	**308**

Between Niewoudtville & Calvinia



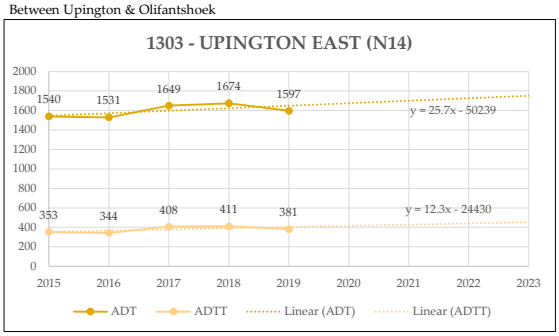
1302 - KEIMOES (N14)						
YEAR	AVERAGE DAILY TRAFFIC (ADT)			AVERAGE DAILY TRUCK TRAFFIC (ADTT)		
	TO UPINGTON	TO KEIMOES	TOTAL	TO UPINGTON	TO KEIMOES	TOTAL
2015	1662	1678	3340	202	201	403
2016	1692	1712	3404	198	198	396
2017	1761	1765	3526	228	228	456
2018	1763	1764	3527	233	229	462
2019	1726	1727	3453	219	220	439
2020	1773	1782	3555	237	236	473
2021	1791	1799	3590	244	243	487
2022	**1808**	**1817**	**3625**	**251**	**250**	**501**
2023	1825	1834	3660	258	257	514
2024	1843	1852	3695	265	264	528
2025	1860	1869	3730	271	271	542
2026	**1878**	**1887**	**3764**	**278**	**277**	**556**

Between Upington & Keimoes



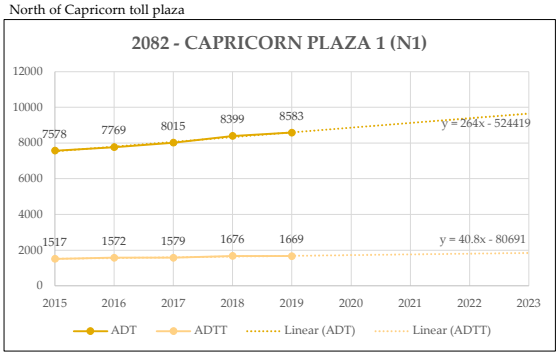
1303 - UPINGTON EAST (N14)						
YEAR	AVERAGE DAILY TRAFFIC (ADT)			AVERAGE DAILY TRUCK TRAFFIC (ADTT)		
	TO OLIFANTSHOEK	TO UPINGTON	TOTAL	TO OLIFANTSHOEK	TO UPINGTON	TOTAL
2015	775	765	1540	178	175	353
2016	770	761	1531	175	169	344
2017	827	822	1649	206	202	408
2018	842	832	1674	209	202	411
2019	804	793	1597	191	190	381
2020	842	833	1675	210	206	416
2021	855	846	1701	217	212	428
2022	**868**	**858**	**1726**	**223**	**218**	**441**
2023	881	871	1752	229	224	453
2024	894	884	1778	235	230	465
2025	907	897	1804	241	236	478
2026	**920**	**909**	**1829**	**248**	**242**	**490**

Between Upington & Olifantshoek



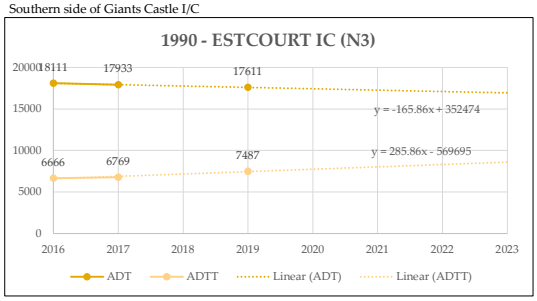
2082 - CAPRICORN PLAZA 1 (N1)						
YEAR	AVERAGE DAILY TRAFFIC (ADT)			AVERAGE DAILY TRUCK TRAFFIC (ADTT)		
	TO BEIT BRIDGE	TO POLOKWANE	TOTAL	TO BEIT BRIDGE	TO POLOKWANE	TOTAL
2015	3839	3739	7578	779	738	1517
2016	3929	3840	7769	803	769	1572
2017	4060	3955	8015	805	774	1579
2018	4245	4154	8399	850	826	1676
2019	4342	4241	8583	865	804	1669
2020	4485	4376	8861	883	842	1725
2021	4619	4506	9125	904	862	1766
2022	**4753**	**4636**	**9389**	**925**	**882**	**1807**
2023	4886	4767	9653	945	902	1847
2024	5020	4897	9917	966	922	1888
2025	5154	5027	10181	987	942	1929
2026	**5287**	**5158**	**10445**	**1008**	**962**	**1970**

North of Capricorn toll plaza



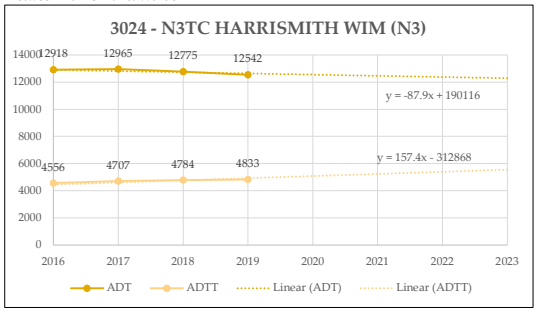
1990 - ESTCOURT IC (N3)						
YEAR	AVERAGE DAILY TRAFFIC (ADT)			AVERAGE DAILY TRUCK TRAFFIC (ADTT)		
	TO SPRINGBOK	TO CAPE TOWN	TOTAL	TO SPRINGBOK	TO CAPE TOWN	TOTAL
2015						
2016	8933	9178	18111	3351	3315	6666
2017	9022	8911	17933	3375	3394	6769
2018						
2019	8847	8764	17611	3590	3897	7487
2020	8544	8893	17437	3794	3949	7742
2021	8463	8808	17271	3934	4094	8028
2022	**8381**	**8724**	**17105**	**4074**	**4240**	**8314**
2023	8300	8639	16939	4214	4386	8600
2024	8219	8554	16773	4354	4532	8886
2025	8138	8470	16608	4494	4677	9172
2026	**8056**	**8385**	**16442**	**4634**	**4823**	**9457**

Southern side of Giants Castle I/C



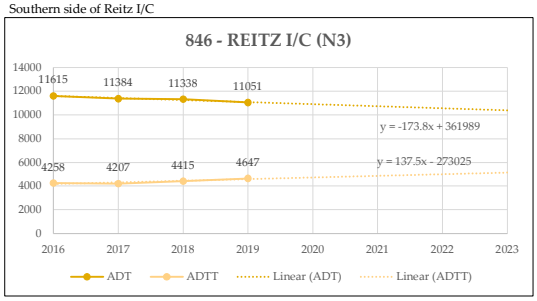
3024 - N3TC HARRISMITH WIM (N3)						
YEAR	AVERAGE DAILY TRAFFIC (ADT)			AVERAGE DAILY TRUCK TRAFFIC (ADTT)		
	TO WARDEN	TO HARRISMITH	TOTAL	TO WARDEN	TO HARRISMITH	TOTAL
2015	6557	6353	12910	2166	1994	4160
2016	6560	6358	12918	2389	2167	4556
2017	6556	6409	12965	2433	2274	4707
2018	6480	6295	12775	2481	2303	4784
2019	6330	6212	12542	2480	2353	4833
2020	6364	6194	12558	2636	2444	5080
2021	6320	6150	12470	2717	2520	5237
2022	**6275**	**6107**	**12382**	**2799**	**2596**	**5395**
2023	6231	6064	12294	2880	2672	5552
2024	6186	6020	12206	2962	2747	5710
2025	6142	5977	12119	3044	2823	5867
2026	**6097**	**5933**	**12031**	**3125**	**2899**	**6024**

Between Harrismith & Warden



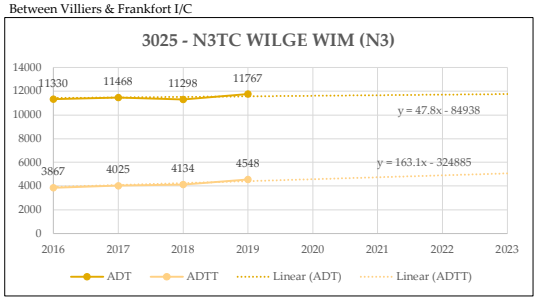
846 - REITZ I/C (N3)						
YEAR	AVERAGE DAILY TRAFFIC (ADT)			AVERAGE DAILY TRUCK TRAFFIC (ADTT)		
			TOTAL			TOTAL
2015						
2016			11615			4258
2017			11384			4207
2018			11338			4415
2019			11051			4647
2020			10913			4725
2021			10739			4863
2022			**10565**			**5000**
2023			10392			5138
2024			10218			5275
2025			10044			5413
2026			**9870**			**5550**

Southern side of Reitz I/C



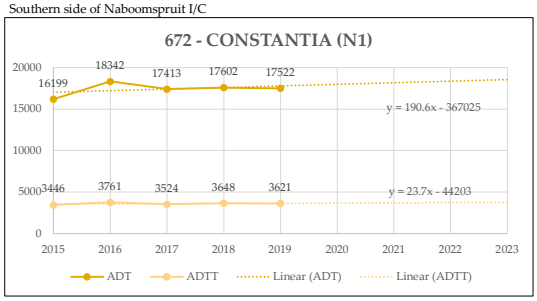
3025 - N3TC WILGE WIM (N3)						
YEAR	AVERAGE DAILY TRAFFIC (ADT)			AVERAGE DAILY TRUCK TRAFFIC (ADTT)		
	TO VILLIERS	TO WARDEN	TOTAL	TO VILLIERS	TO WARDEN	TOTAL
2015	5849	5663	11512	2040	1826	3866
2016	5744	5586	11330	2034	1833	3867
2017	5796	5672	11468	2093	1932	4025
2018	5839	5459	11298	2155	1979	4134
2019	5788	5979	11767	2336	2212	4548
2020	5876	5742	11618	2388	2189	4577
2021	5901	5765	11666	2473	2267	4740
2022	**5925**	**5789**	**11714**	**2558**	**2345**	**4903**
2023	5949	5812	11761	2644	2423	5066
2024	5973	5836	11809	2729	2501	5229
2025	5997	5860	11857	2814	2579	5393
2026	**6021**	**5883**	**11905**	**2899**	**2657**	**5556**

Between Villiers & Frankfort I/C



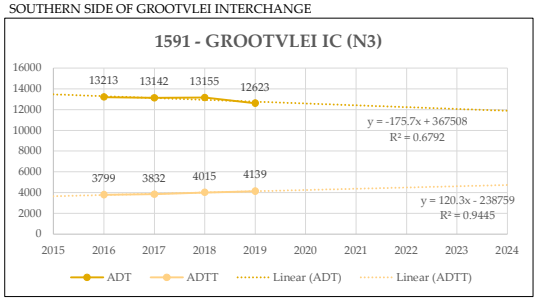
672 - CONSTANTIA (N1)						
YEAR	AVERAGE DAILY TRAFFIC (ADT)			AVERAGE DAILY TRUCK TRAFFIC (ADTT)		
			TOTAL			TOTAL
2015			16199			3446
2016			18342			3761
2017			17413			3524
2018			17602			3648
2019			17522			3621
2020			17987			3671
2021			18178			3695
2022			**18368**			**3718**
2023			18559			3742
2024			18749			3766
2025			18940			3790
2026			**19131**			**3813**

Southern side of Naboomspruit I/C



1591 - GROOTVLEI IC (N3)						
YEAR	AVERAGE DAILY TRAFFIC (ADT)			AVERAGE DAILY TRUCK TRAFFIC (ADTT)		
	NORTHBOUND	SOUTHBOUND	TOTAL	NORTHBOUND	SOUTHBOUND	TOTAL
2015						
2016	6 508	6 705	13 213	2 002	1 797	3 799
2017	6 684	6 458	13 142	2 016	1 816	3 832
2018	6 678	6 477	13 155	2 100	1 915	4 015
2019	6 443	6 180	12 623	2 148	1 991	4 139
2020	0	12 594	12 594	0	4 247	4 247
2021	0	12 418	12 418	0	4 367	4 367
2022	**0**	**12 243**	**12 243**	**0**	**4 488**	**4 488**
2023	0	12 067	12 067	0	4 608	4 608
2024	0	11 891	11 891	0	4 728	4 728
2025	0	11 716	11 716	0	4 849	4 849
2026	**0**	**11 540**	**11 540**	**0**	**4 969**	**4 969**

SOUTHERN SIDE OF GROOTVLEI INTERCHANGE



ANNEXURE C:

ASSESSMENT METHODOLOGY

Impact Rating System

Impact assessment must take account of the nature, scale and duration of impacts on the environment whether such impacts are positive or negative. Each impact is also assessed according to the project phases:

- planning
- construction
- operation
- decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance should also be included. The rating system is applied to the potential impacts on the receiving environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each impact, the following criteria is used:

The rating system

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be experienced.		
1	Site	The impact will only affect the site.
2	Local/district	Will affect the local area or district.
3	Province/region	Will affect the entire province or region.
4	International and National	Will affect the entire country.
PROBABILITY		
This describes the chance of occurrence of an impact.		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).

DURATION		
This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.
INTENSITY/ MAGNITUDE		
Describes the severity of an impact.		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

REVERSIBILITY		
This describes the degree to which an impact can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures.
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible cumulative impact	The impact would result in negligible to no cumulative effects.
2	Low cumulative impact	The impact would result in insignificant cumulative effects.
3	Medium cumulative impact	The impact would result in minor cumulative effects.
4	High cumulative impact	The impact would result in significant cumulative effects
SIGNIFICANCE		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula: (Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity. The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	Impact significance rating	Description
6 to 28	Negative low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.

6 to 28	Positive low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative high impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive high impact	The anticipated impact will have significant positive effects.
74 to 96	Negative very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive very high impact	The anticipated impact will have highly significant positive effects.

Nature of the impact:	(N/A) No impact	(+) Positive Impact	(-) Negative Impact		
Geographical extent:	(S) Site;	(L) Local / District;	(P) Province / Region;	(I) International and National	
Probability:	(U) Unlikely;	(Po) Possible;	(Pr) Probable;	(D) Definite	
Duration:	(S) Short Term;	(M) Medium Term;	(L) Long Term;	(P) Permanent	
Intensity / Magnitude:	(L) Low;	(M) Medium;	(H) High;	(VH) Very High	
Reversibility:	(CR) Completely Reversible;	(PR) Partly Reversible;	(BR) Barely Reversible;	-	
Irreplaceable loss of resources:	(IR) Irreversible	(NL) No Loss;	(ML) Marginal Loss;	(SL) Significant Loss;	(CL) Complete Loss
Level of residual risk:	(L) Low;	(M) Medium;	(H) High;	(VH) Very High	-