PROPOSED DUNEVELD PV DEVELOPMENT: SOLAR ENERGY PV FACILITY AND ASSOCIATED INFRASTRUCTURE, NORTHERN CAPE PROVINCE

TRANSPORT STUDY

MARCH 2020
Final Issue

Prepared by:

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SYNOPSIS

Preparation of a Transport Study for the proposed Duneveld PV Solar Energy Facility in the Northern Cape Province, pertaining to all relevant traffic and transportation engineering aspects.

KEY WORDS:

Solar Energy Facility, Transport Study

QUALITY VERIFICATION

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

Verification	Capacity	Name	Signature	Date
By Author	Senior Technologist	Adrian Johnson		30/03/2020
Checked by:	Associate	Iris Wink		30/03/2020
Authorised by:	Director	Harold Tiganis		30/03/2020

Filename:	X\5314_JG_Transport Study_Duneveld PV

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SPECIALIST EXPERTISE

IRIS SIGRID WINK

Profession	Civil Engineer (Traffic & Transportation)
Position in Firm	Associate
Area of Specialisation	Manager: Traffic & Transportation Engineering
Qualifications	PrEng, MSc Eng (Civil & Transportation)
Years of Experience	17 Years
Years with Firm	7 Years

SUMMARY OF EXPERIENCE

Iris is a Professional Engineer registered with ECSA (20110156). She joined JG Afrika (Pty) Ltd. in 2012. Iris obtained a Master of Science degree in Civil Engineering in Germany and has more than 15 years of experience in a wide field of traffic and transport engineering projects. Iris left Germany in 2003 and has worked as a traffic and transport engineer in South Africa and Germany. She has technical and professional skills in traffic impact studies, public transport planning, non- motorised transport planning and design, design and development of transport systems, project planning and implementation for residential, commercial and industrial projects and providing conceptual designs for the abovementioned. She has also been involved with transport assessments for renewable energy projects and road safety audits.

PROFESSIONAL REGISTRATIONS & INSTITUTE MEMBERSHIPS

PrEng -Registered with the Engineering Council of South Africa No. 20110156
-Registered Mentor with ECSA for the Cape Town Office of JG Afrika
MSAICE -Member of the South African Institution of Civil Engineers
ITSSA -Member of ITS SA (Intelligent Transport Systems South Africa)
SAWEA -Member of the South African Wind Energy Association
SARF -South African Road Federation: Committee Member of Council
SARF WR - SARF Western Region Committee Member
SARF RSC - Road Safety Committee Member
IRF - Global Road Safety Audit Team Leader with the International Road Federation (IRF)

EDUCATION

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

SPECIFIC EXPERIENCE

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

- **Rondekop Windfarm** – Transport study for the proposed Kudusberg Windfarm near Sutherland, Northern Cape – Client: G7 Renewable Energies

- **Kudusberg Windfarm** – Transport study for the proposed Kudusberg Windfarm near Sutherland, Northern Cape – Client: G7 Renewable Energies
- **Multiple Traffic Impact and Route Assessment** for the proposed Solar PV Facilities in the Northern Cape – Client: Private Developer
- **Kuruman Windfarm –** Transport study for the proposed Kuruman Windfarm in Kuruman, Northern Cape – Client: Mulilo Renewable Project Developments
- **Coega West Windfarm** – Transportation and Traffic Management Plan for the proposed Coega Windfarm in Coega, Port Elizabeth – Client: Electrawinds Coega
- **Traffic and Parking Audits** for the Suburb of Groenvallei in Cape Town – Client: City of Cape Town Department of Property Management.
- **Road Safety Audit** for the Upgrade of N1 Section 4 Monument River – Client: Aurecon on behalf of SANRAL
- **Sonop Windfarm** – Traffic Impact Assessment for the proposed Sonop Windfarm, Coega, Port Elizabeth – Client: Founders Engineering
- **Universal Windfarm** - Traffic Impact Assessment for the proposed Universal Windfarm, Coega, Port Elizabeth – Client: Founders Engineering
- **Road Safety Audit** for the Upgrade of N2 Section 8 Knysna to Wittedrift – Client: SMEC on behalf of SANRAL
- **Road Safety Audit** for the Upgrade of N1 Section 16 Zandkraal to Winburg South – Client: SMEC on behalf of SANRAL
- **Traffic and Road Safety Studies** for the Improvement of N7 Section 2 and Section 3 (Rooidraai and Piekenierskloof Pass) – Client: SANRAL
- **Road Safety Appraisal**s for Northern Region of Cape Town – Client: Aurecon on behalf of City of Cape Town (TCT)
- **Traffic Engineering Services** for the Enkanini Informal Settlement, Kayamandi - Client: Stellenbosch Municipality
- **Lead Traffic Engineer** for the Upgrade of a 150km Section of the National Route N2 from Kangela to Pongola in KwaZulu-Natal, Client: SANRAL
- **Traffic Engineering Services** for the Kosovo Informal Settlement (which is part of the Southern Corridor Upgrade Programme), Client: Western Cape Government
- **Traffic and Road Safety Studies** for the proposed Kosovo Informal Housing Development (part of the Southern Corridor Upgrade Program), Client: Western Cape Government.
- **Road Safety Audit Stage 3** – Upgrade of the R573 Section 2 between Mpumalanga/Gauteng and Mpumalanga/Limpopo, Client: AECOM on behalf of SANRAL
- **Road Safety Audit Stage 1 and 3** – Upgrade of the N2 Section 5 between Lizmore and Heidelberg, Client: Aurecon on behalf of SANRAL
- **Traffic Safety Studies** for Roads Upgrades in Cofimvaba, Eastern Cape – Client: Cofimvaba Municipality
- **Road Safety Audit Stage 1 and 3** – Improvement of Intersections between Olifantshoek and Kathu, Northern Cape, Client: Nadeson/Gibb on behalf of SANRAL
- **Road Safety Audit Stage 3** – Upgrade of the Beacon Way Intersection on the N2 at Plettenberg Bay, Client: AECOM on behalf of SANRAL

- **Traffic Impact Assessment** for a proposed Primary School at Die Bos in Strand, Somerset West, Client: Edifice Consulting Engineers
- **Road Safety Audit** Stage 1 and 3 – Improvement of R75 between Port Elizabeth and Uitenhage, Eastern Cape, Client: SMEC on behalf of SANRAL

SPECIALIST DECLARATION

I, **IRIS WINK**, as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- I act as the independent specialist in this application;
- I perform the work relating to the application in an objective manner, even if this results in views and findings that are not favorable to the applicant;
- Regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- All the particulars furnished by me in this specialist input/study are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist: _____

Name of Specialist: IRIS WINK

Date: 30/03/2020

COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Addressed in the Specialist Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Yes. See attached CV
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Yes. See attached declaration
c) an indication of the scope of, and the purpose for which, the report was prepared;	Yes. See section 1.1
(cA) an indication of the quality and age of base data used for the specialist report;	n/a
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Yes. See section 6.1
d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	n/a
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Yes. See section 1.3
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Yes. Chapters 3 and 6
g) an identification of any areas to be avoided, including buffers;	Yes. Chapter 3
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	n/a
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Yes. Section 1.4
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment or activities;	Yes. Chapters 3, 6, 8 and 9
k) any mitigation measures for inclusion in the EMPr;	Yes. Chapter 10
l) any conditions for inclusion in the environmental authorisation;	n/a
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	n/a
n) a reasoned opinion- i. as to whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Yes. Chapter 6
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	n/a
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	n/a
q) any other information requested by the competent authority.	n/a
2) Where a government notice *gazetted* by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	n/a

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1 INTRODUCTION AND METHODOLOGY

1.1 Scope and Objectives

Duneveld PV (Pty) Ltd is proposing the development of a commercial solar photovoltaic (PV) facility and associated infrastructure on a site located approximately 30km south-west of Upington within the Kai !Garib Local Municipality and the ZF Mgcawu District Municipality in the Northern Cape Province.

The power generated from the project will be sold to Eskom and will feed into the national electricity grid. Ultimately, the project is intended to be a part of the renewable energy projects portfolio for South Africa, as contemplated in the Integrated Resource Plan.

A separate basic assessment process will be undertaken for the grid connection infrastructure to connect the Duneveld PV solar PV facility to the Upington Main Transmission Substation.

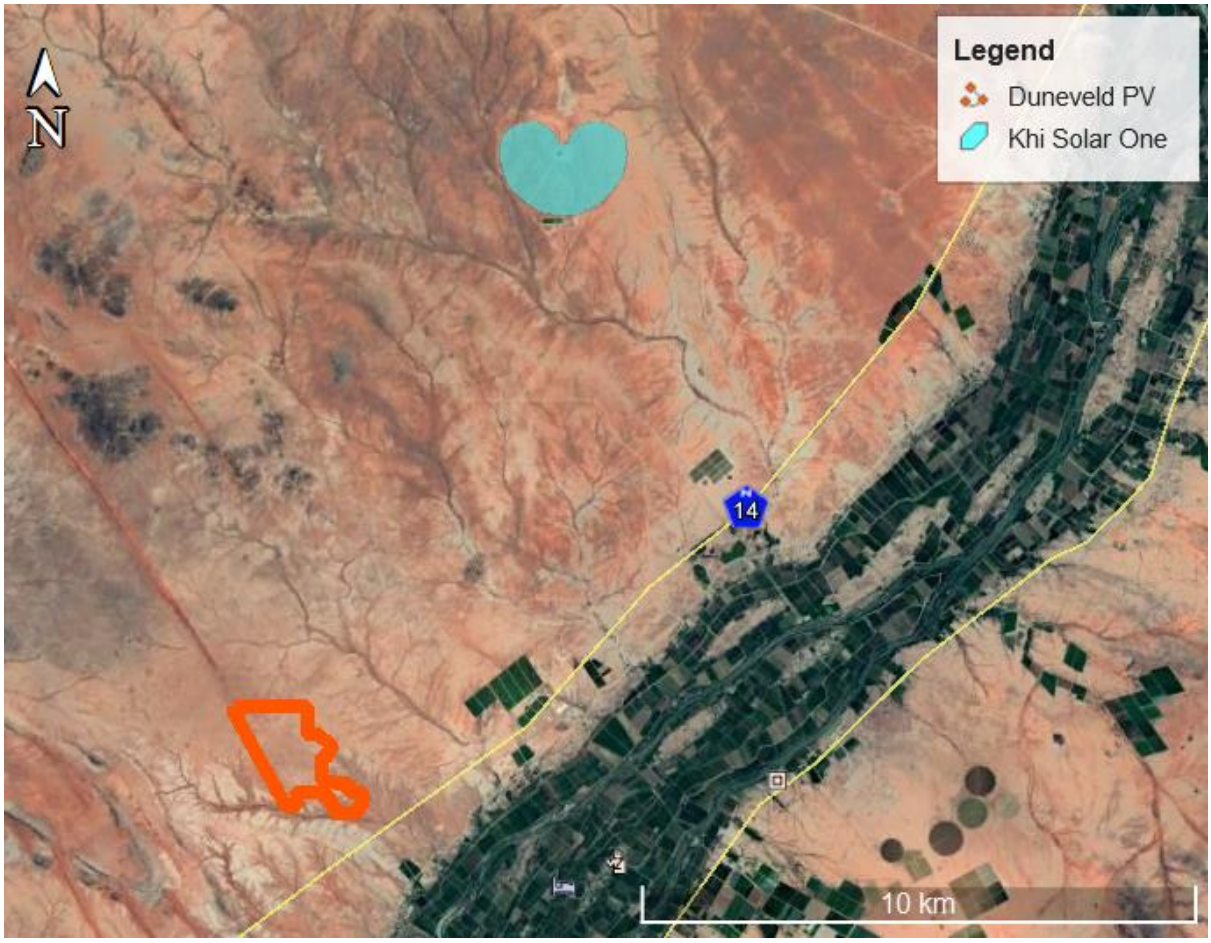

Figure 1-1: Duneveld PV Development site

As part of the environmental impact processes, the services of a Transportation Specialist are required to conduct a Transport Study. The main objective of this report is to undertake the Transport Study for the proposed Duneveld PV Development site.

The following two main transportation activities will be investigated:

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

The transport study will aim to provide the following objectives:

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

1.2 Terms of Reference

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

General:

- A description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed project;
- A description and evaluation of environmental issues and potential impacts (including direct, indirect, cumulative impacts and residual risks) that have been identified; and
    - Direct, indirect, cumulative impacts and residual risks of the identified issues must be evaluated within the EIA Report in terms of the following criteria:
    - The nature, which shall include a description of what causes the effect, what will be affected and how it will be affected;
    - A statement regarding the potential significance of the identified issues based on the evaluation of the issues/impacts;
    - A comparative evaluation of the identified feasible alternatives, and nomination of a preferred alternative;
    - Any aspects conditional to the findings of the assessment which are to be included as conditions of the Environmental Authorisation;
    - This must also include any gaps in knowledge at this point of the study. Consideration of areas that would constitute “acceptable and defendable loss” should be included in this discussion;
    - A reasoned opinion as to whether the proposed project should be authorized;
    - Summary of the positive and negative impacts and risks of the proposed project and identified alternatives; and
    - Mitigation measures and management recommendations to be included in the Environmental Management Programme to be submitted with the FEIR.

Specific:

- Extent of the transport study and study area;
- The proposed development;

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

1.3 Approach and Methodology

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

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

This transport study was informed by the following:

Project Assessment

- Overview of project background information including location maps, component specs and any possible resulting abnormal loads to be transported; and
- Research of all available documentation and information relevant to the proposed facility.

The transport study considered and assessed the following:

Traffic and Haul Route Assessment

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

Site layout, Access Points and Internal Roads Assessment per Site

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

The findings of the transport assessment are detailed in this report prepared as part of the environmental impact assessment process for the proposed Duneveld PV Development.

1.4 Assumptions and Limitations

The following assumptions and limitations apply:

- This study is based on the project information provided by Duneveld PV (Pty) Ltd;
- According to the Eskom Specifications for Power Transformers (Eskom Power Series, Volume 5: Theory, Design, Maintenance and Life Management of Power Transformers), the following dimensional limitations need to be kept when transporting the transformer – total maximum height 5 000mm, total maximum width 4 300 mm and total maximum length 10 500 mm;

- Maximum vertical height clearances along the haulage route is 5.2 m for abnormal loads;
- Imported elements will be transported from the most feasible port of entry, which is deemed to be the Port of Saldanha in the Western Cape;
- If any elements are manufactured within South Africa, these will be transported from their respective manufacturing centers, which would be either in the greater Johannesburg, Pinetown/Durban or Cape Town for the transformer, inverter and the support structures.
- All haulage trips will occur on either surfaced national and provincial roads or existing gravel roads; and
- Material for the construction of internal access roads will be sourced locally as far as possible.

1.5 Source of Information

Information used in a transport study includes:

- Project Information provided by Duneveld PV (Pty) Ltd;
- Google Earth.kmz provided by Duneveld PV (Pty) Ltd;
- Google Earth Satellite Imagery;
- Information gathered during the site visit; and
- Project research of all available information.

2 DESCRIPTION OF PROJECT ASPECTS RELEVANT TO THE TRANSPORT STUDY

2.1 Port of Entry

The two possible ports of entry to receive the imported parts are Saldanha and Port Elizabeth. The distance from Port Elizabeth to the site via road is approximately 930km ,and from Saldanha to the site approximately 780km via the N7 and R27 (shown in purple in the following Figure 2-1) and approximately 870km via the N7 and N14 (shown in green in Figure 2-1). Based on shortest travel distance, the preferred port of entry is Saldanha.

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

Figure 2-1: Haulage Routes (Port of Entry - Saldanha)

2.2 Transportation requirements

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

- Conventional trucks within the freight limitations to transport building material to the site;
- 40ft container trucks transporting solar panels, frames and the inverter, which are within freight limitations;
- Flatbed trucks transporting the solar panels and frames, which are within the freight limitations;
- Light Differential Vehicle (LDV) type vehicles transporting workers from surrounding areas to site;
- Drilling machines and other required construction machinery being transported by conventional trucks or via self-drive to site; and
- The transformers will be transported as abnormal loads.

2.3 Abnormal Load Considerations

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

- Length: 22 m for an interlink, 18.5 m for truck and trailer and 13.5 m for a single unit truck
- Width: 2.6 m
- Height: 4.3 m measured from the ground. Possible height of load – 2.7 m.
- Weight: Gross vehicle mass of 56 t resulting in a payload of approximately 30t
- Axle unit limitations: 18 t for dual and 24 t for triple-axle units
- Axle load limitation: 7.7 t on the front axle and 9 t on the single or rear axles

Any dimension / mass outside the above will be classified as an Abnormal Load and will necessitate an application to the Department of Transport and Public Works for a permit that will give authorisation for the conveyance of said load. A permit is required for each Province that the haulage route traverses.

2.4 Further Guideline Documentation

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

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

2.5 Permitting – General Rules

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

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

2.6 Load Limitations

The maximum load that a road vehicle or combination of vehicles will be allowed to carry legally under permit on a public road is limited by:

- the capacity of the vehicles as rated by the manufacturer;
- the load which may be carried by the tyres;
- the damaging effect on pavements;
- the structural capacity on bridges and culverts;
- the power of the prime mover(s);
- the load imposed by the driving axles; and
- the load imposed by the steering axles.

2.7 Dimensional Limitations

A load of abnormal dimensions may cause an obstruction and danger to other traffic. For this reason, all loads must, as far as possible, conform to the legal dimensions. Permits will only be considered for indivisible loads, i.e. loads that cannot, without disproportionate effort, expense or risk of damage, be divided into two or more loads for the purpose of transport on public roads. For each of the characteristics below there is a legally permissible limit and what is allowed under permit:

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

2.8 Transporting Other Plant, Material and Equipment

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

3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 Description of the site

A preferred project site with an extent of 212 ha has been identified by Duneveld PV (Pty) Ltd as a technically suitable site for the development of a solar PV facility with a contracted capacity of up to 100MW. The entire project site is located within Focus Area 7 of the Renewable Energy Development Zones (REDZ), which is known as the Upington REDZ. Due to the location of the project site within a REDZ, a Basic Assessment (BA) process will be undertaken in accordance with GN113 and GN114 as formally gazetted on 16 February 2018. The project site is located on the following farm portion:

- Remaining Extent of Geel Kop Farm No 456.

The Khi Solar One concentrated solar power plant is located north of the proposed site.

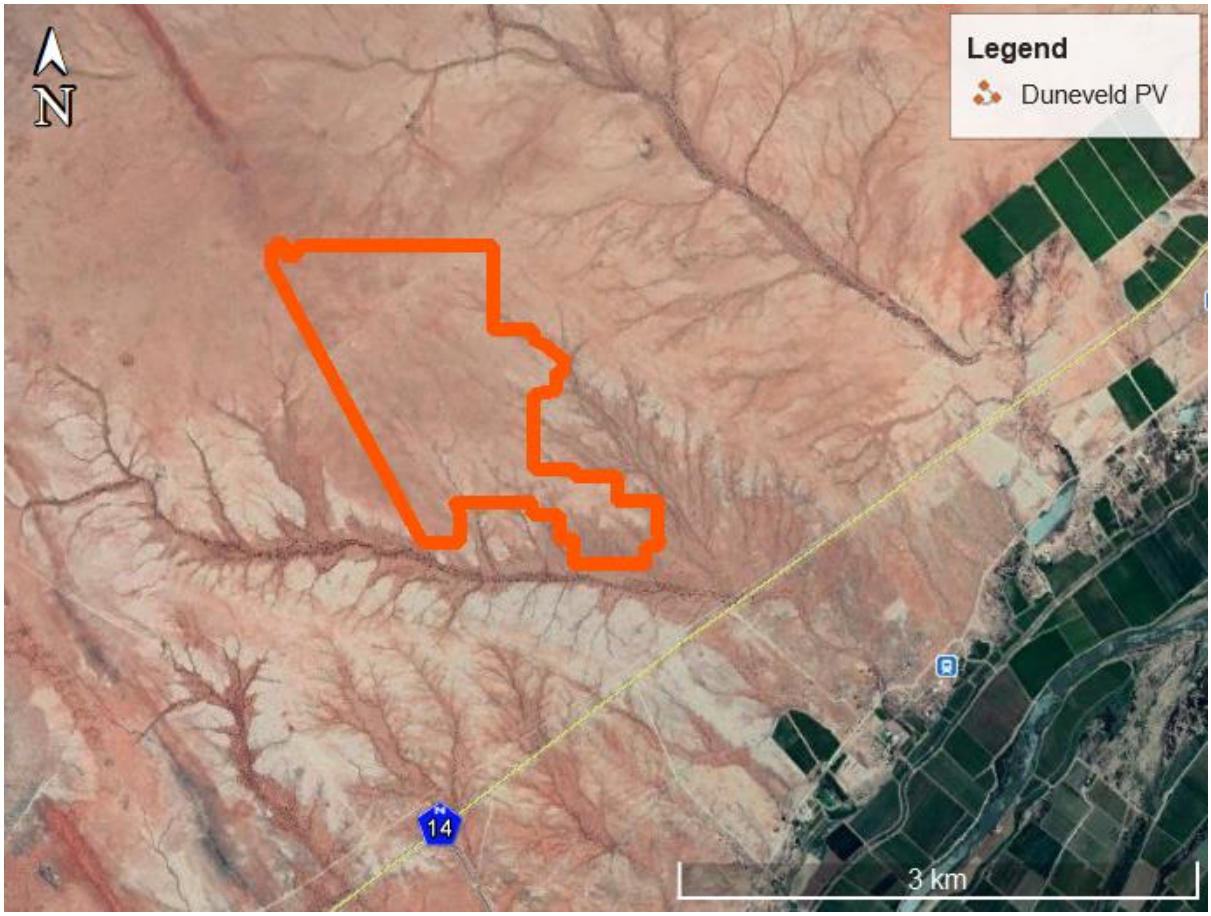

Figure 3-1: Aerial View of Proposed Duneveld PV Development

The PV energy facility is to consist of solar photovoltaic (PV) technology, fixed-tilt-, single-axis tracking- or dual-axis tracking- mounting structures, with a net generating capacity of 100MW as well as associated infrastructure, which will include:

- On-site switching-station / substation;
- Auxiliary buildings (gatehouse and security, control center, office, warehouse, canteen & visitors center, staff lockers etc.);
- Inverter-stations, transformers and internal electrical reticulation (underground cabling);
- Access and internal road network;
- Laydown area;

- Duneveld PV will connect from the onsite sub-station to the Upington MTS (400/132 kV), via the 132kV Geelkop Collector Substation;
- Rainwater tanks; and
- Perimeter fencing and security infrastructure.

3.2 National Route to Site for Imported Components

It is assumed that the Solar PV panels will be imported and transported to the site. There are two viable options for the port of entry for imported components - the Port of Saldanha in the Western Cape and the Port of Ngqura in Port Elizabeth. The Port of Saldanha is located approximately 870km away from the site via the N7 and N14 whilst the Port of Ngqura is located approximately 930km travel distance from the proposed site. The Port of Saldanha is the preferred port of entry due to the shorter travelling distance, however, the Port of Ngqura can be used as an alternative should the Port of Saldanha not be available.

The preferred route from the preferred point of entry is shown in green in the Figure below. An alternative route, shown in purple, deviates from the preferred route at Vanrhynsdorp. The preferred route is approximately 870km in length and will start at the Port of Saldanha, heading east to Moorreesburg via the R45 and passing Piketberg, Vanrhynsdorp via the N7, heading east at Springbok onto the N14 and passing Keimoes via the N14 en route to the site.

An alternative route from the Port of Ngqura, shown in blue in the Figure below, is approximately 930km in length and follows the N10 in a northwest direction en route towards Upington. The route passes Upington onto the N14 and heads west along the N14 to the proposed site.

Figure 3-2: Haulage Routes

With the above route options there are several passes, bridges and other road structures, which the haulage vehicles will pass over. However, none of the imported goods will require abnormal loads and there are no limitations for normal heavy vehicles using these routes.

3.3 Route for Components manufactured within South Africa

It is anticipated that elements manufactured within South Africa will be transported to the site from the Cape Town, Johannesburg and/or Pinetown/Durban areas.

The transformer will be transported with an abnormal load vehicle and therefore it needs to be verified that the route from the manufacturer to the site does not have any load limitations for abnormal vehicles. At this stage, only a high-level assessment can be undertaken as no information of the exact location of the manufacturer is known and all road structures (such as bridges and culverts) need to be confirmed for their load bearing by SANRAL or the respective Roads Authority.

It is critical to ensure that the abnormal load vehicle will be able to move safely and without obstruction along the preferred route. The preferred route should be surveyed prior to construction to identify any problem areas, e.g. intersections with limited turning radii and sections of the road with sharp horizontal curves or steep gradients, that may require modification. After the road modifications have been implemented, it is recommended to undertake a "dry-run" with the largest abnormal load vehicle, prior to the transportation of any components, to ensure that the delivery will occur without disruptions.

3.3.1 Route from Johannesburg Area to Site – Normal Loads

With the haulage distance being the minimal haulage distance to site, it is assumed that the inverter and support structure will be manufactured in the Johannesburg area and transported to site via road. The general route distance is around 820km and no road limitations are expected on this route for normal loads vehicles as it will mainly follow national and provincial roads. The haulage route is shown in the Figure 3-3 below.

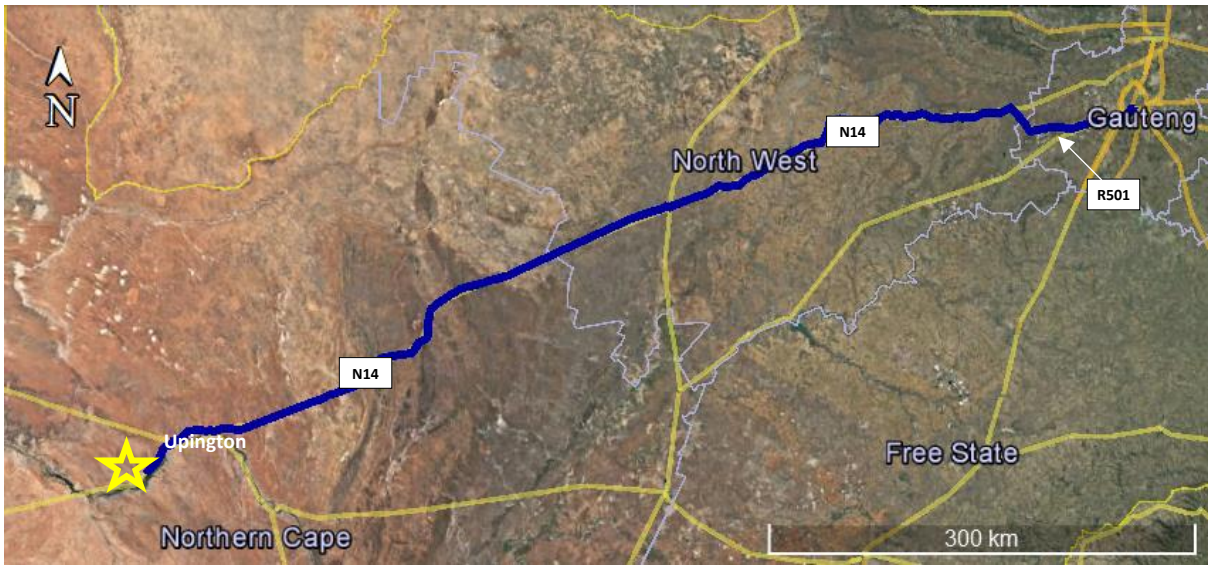

Figure 3-3: Haulage Route from Johannesburg Area to Site for Normal Loads

3.3.2 Route from Pinetown / Durban to Site - Normal load

As a manufacturing centre, Pinetown/Durban can manufacture the inverter and support structures which will then be transported to site via road transportation.

The inverter and support structures elements are typically transported as normal loads and no road limitations are envisaged along the route for normal load freight, shown in the Figure below. Haulage

vehicles will mainly travel on national and provincial roads and the total distance is approximately 1 200km.This distance is however approximately 380km longer than the Johannesburg haulage route.

Figure 3-4: Haulage Route from Pinetown Area to Site

3.3.3 Route from Cape Town Area to Site – Normal Load

The inverter and support structures can also alternatively be manufactured in Cape Town and transported to site. The recommended haulage route for this option will follow National Road N7 from Cape Town to Moorreesburg. From Moorreesburg it will follow the same route proposed for the imported components, shown in Figure 3-2. The general route distance is around 870km and no road limitations are expected on this route for normal loads vehicles as it will mainly follow national and provincial roads. The route is, however, approximately 50km longer than the Johannesburg haulage route.

3.3.4 Route from Johannesburg Area to Site – Abnormal Load

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

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

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

3.4 Proposed main access road to the Proposed Development

The main access road to the proposed development will be the N14, shown in the Figure below. The N14 road is also earmarked as the main access road to proposed renewable energy facilities on neighbouring farms.

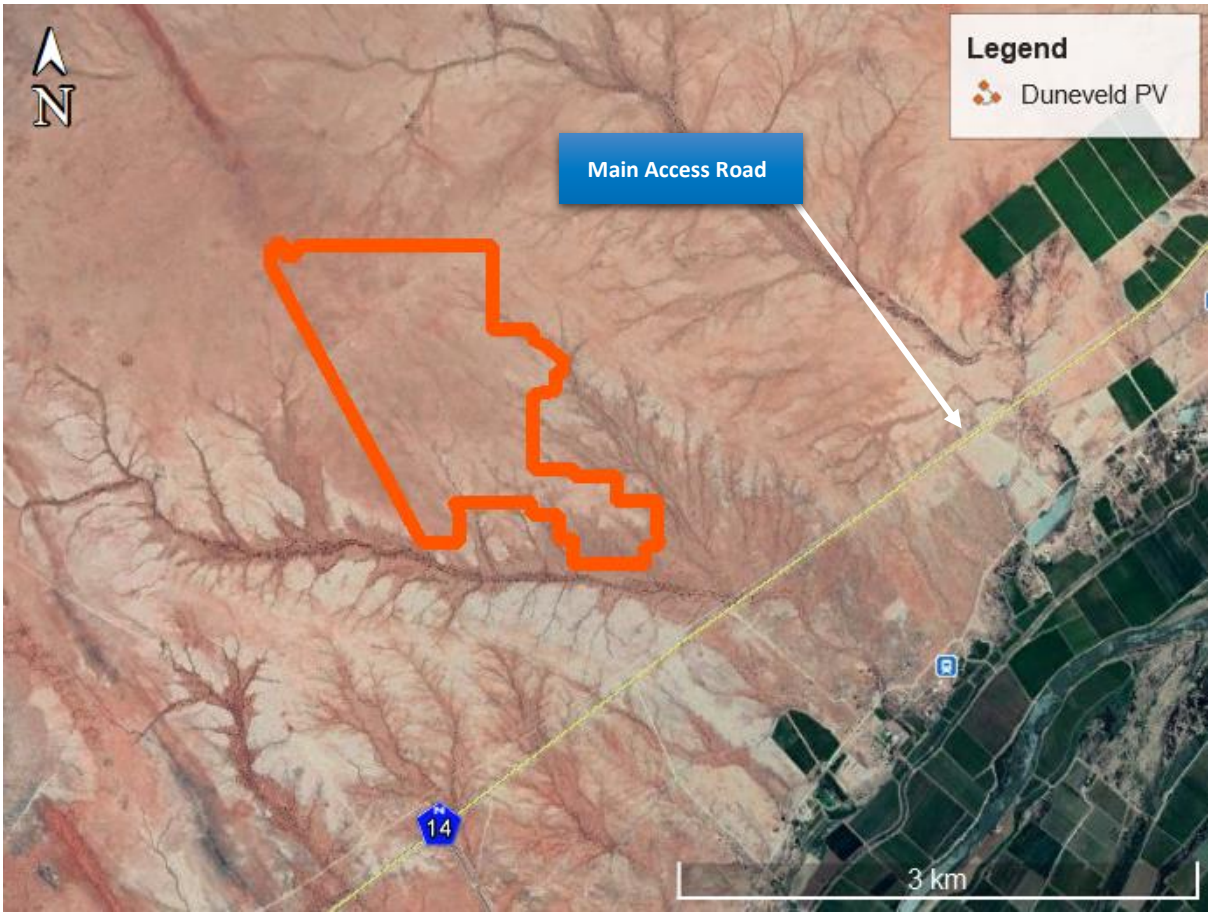

Figure 3-5: Main Access Road to the Development

3.4.1 Proposed Access Route

Four access points were investigated, show in the Figure below. All the potential access points are located off the N14 and will allow practically direct access to the Duneveld PV site.

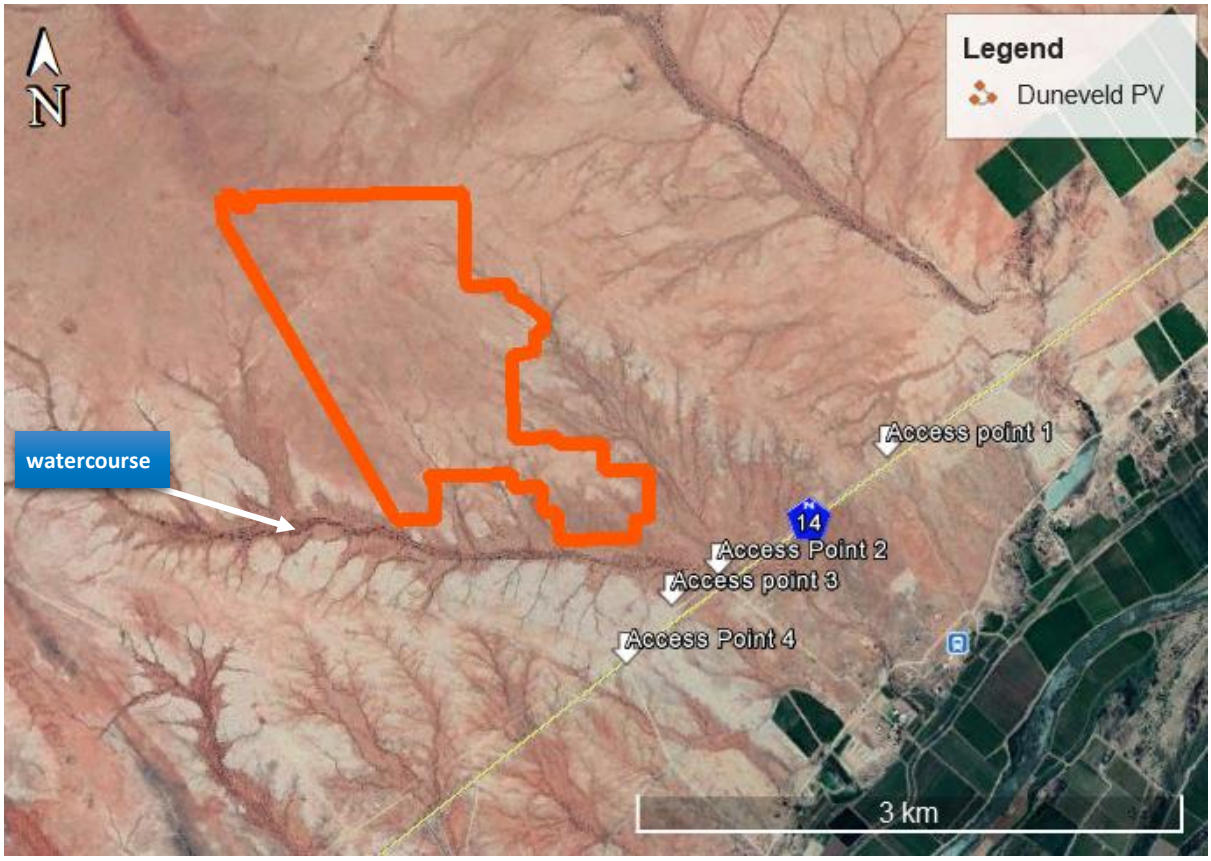

Figure 3-6: Potential Access Points

The N14 is a single carriageway with one lane per direction running in an east-west direction. Sight distances at the intersections/access points are deemed acceptable.

Figure 3-7: N14

Access point 1 is an existing farm access. It is proposed that the Duneveld PV site be accessed via a 4.67km new road, shown in the **Figure 3-9** below. The alignment of the new road predominantly follows an existing gravel track.

Figure 3-8: Access point 1 - Existing

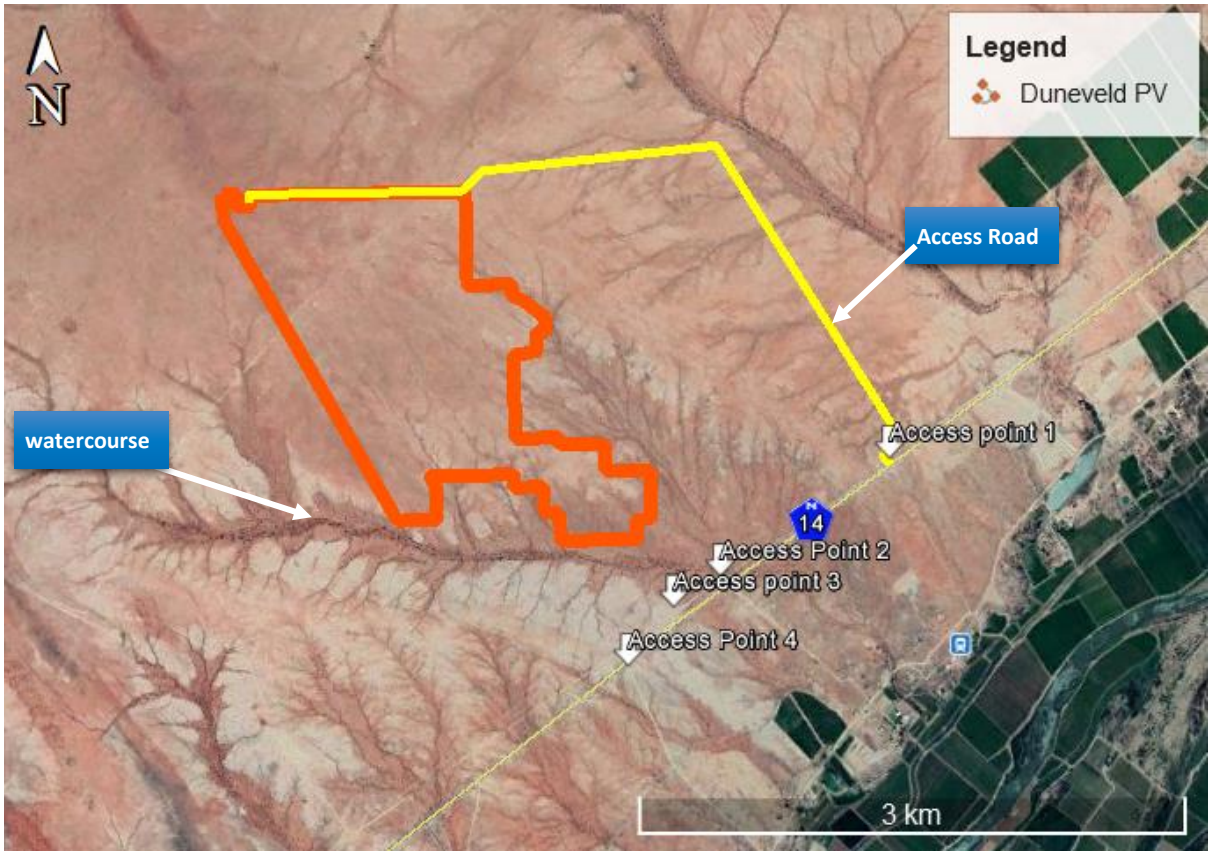

Figure 3-9: Access point 1 and new access road

Access points 2 to 4, although also in close proximity to the site boundary, would require the construction of a bridge structure over the existing watercourse.

Figure 3-10: Access Point 2 - Existing

Figure 3-11: Access Point 3 - Existing

Figure 3-12: Access Point 4 - Existing

Access point 1 **is deemed the preferred access route** as it allows direct access to the proposed site and does not require additional structures.

The access point proposed for Duneveld PV will need to be upgraded to cater for the construction vehicles navigating the road to the laydown areas on site. Generally, the road width at the access point needs to be a minimum of 6m and the access roads on site a minimum of 5m. The radius at the access point from the N14 needs to be large enough to allow for all construction vehicles to turn safely. It is recommended that the access point shall be surfaced and the internal access roads on site can remain gravel.

The exact location and design of the internal access road to the Duneveld PV Development needs to be established at detailed design stage. Existing structures and services such as drainage structures and pipelines will need to be evaluated if impacting on the access road.

It is recommended that the site access be controlled via boom and gatehouse. It is also recommended that security staff be stationed on site at the access booms during construction and that an electronic number plate reader will be implemented once the solar farm is in operation. It is recommended to allow for at least 25m stacking distance at the boom access to the site.

It needs to be ensured that the gravel sections of the haulage routes remain in good condition and will hence need to be maintained during the additional loading of the construction phase and then reinstated after construction is completed. The gravel roads will require grading with a grader to obtain a flat even surface and the geometric design of these gravel roads needs to be confirmed at detailed design stage.

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

The nearest towns in relation to the proposed site are Upington, Keimos and Kakamas. It is envisaged that most of the materials, plant and labour will be sourced from these towns.

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

It is envisaged that most materials, water, plant, services and people will be procured within a 60 km radius from the proposed site; however, this would be informed by the REIPPPP requirements.

4 APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

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

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

5 IDENTIFICATION OF KEY ISSUES

5.1 Identification of Potential Impacts

The potential transport related impacts are described below.

5.1.1 Construction Phase

Potential impact

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

5.1.2 Operational Phase

During operation, it is expected that staff and security will periodically visit the facility. Approximately 30 full-time employees will be stationed on site. The traffic generated during this phase will be minimal and will not have an impact on the surrounding road network.

5.1.3 Decommissioning Phase

This phase will result in the same impact as the Construction Phase as similar trips are expected.

5.1.4 Cumulative Impacts

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

6 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

6.1 Potential Impact (Construction Phase)

Nature of the impact

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

Significance of impact without mitigation measures

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

From experience on other projects of similar nature, the number of heavy vehicles per 7MW installation is estimated to range between 200 and 300 trips depending on the site conditions and requirements. For the 100MW, the total trips can therefore be estimated to be between 2 858 and 4 286 heavy vehicle trips, which will generally be made over a 12-month construction period. Choosing the worst-case scenario of 4 286 heavy vehicles over a 12-month period travelling on an average of 22 working days per month, the resulting daily number of vehicle trips is approximately 17. Considering that the number of vehicle trips during peak hour traffic in a rural environment can roughly be estimated at around 20-40% of the average daily traffic, the resulting vehicle trips for the construction phase are approximately 4-7 trips. The impact on general traffic on the N14 is therefore deemed nominal.

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

During operation, approximately 30 full-time employees will be stationed on site and hence vehicle trips generated will be low and will have a negligible impact on the external road network.

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

- 5 000 litre water bowsers to be used for transporting the water
- Approximately 5 litres of water needed per panel
- A range of between 350,000 – 400,000 Solar panels are expected for the site
- Assuming the worst-case scenario of 400,000 Solar panels, the total number of trips is therefore approximately 400 water bowsers can be expected.
- Panels will be cleaned up to four times a year.

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

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

Proposed mitigation measures

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

Significance of impact with mitigation measures

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

7 NO-GO ALTERNATIVE

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

8 IMPACT ASSESSMENT SUMMARY

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

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

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

Table 8-2: Impact Rating - Construction Phase – Dust Pollution

IMPACT TABLE – CONSTRUCTION PHASE		
Environmental Parameter	*Air quality will be affected by dust pollution*	
Issue/Impact/Environmental Effect/Nature	*Traffic on roads will generate dust.*	
Reversibility	*Completely reversible*	
Irreplaceable loss of resources	*No loss*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	Local (2)	Local (1)
Probability	Highly probable (4)	Improbable (2)
Duration	Very Short (1)	Very Short (1)
Magnitude	Moderate (5)	Minor (2)
Significance rating	Medium (32)	Low (8)
Mitigation measures	• *Dust Suppression of gravel roads during the construction phase, as required.* • *Regular maintenance of gravel roads by the Contractor during the construction phase and by Client/Facility Manager during operation phase.*	
Residual Risks:	• *Dust pollution during the construction phase cannot be completely mitigated but mitigation measures will significantly reduce the impact. Dust pollution is limited to the construction period.*	

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

IMPACT TABLE – CONSTRUCTION PHASE		
Environmental Parameter	*Noise pollution due to increased traffic.*	
Issue/Impact/Environmental Effect/Nature	*Traffic on roads will generate noise.*	
Reversibility	*Completely reversible*	
Irreplaceable loss of resources	*No loss*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	Local (2)	Local (1)
Probability	Highly probable (4)	Improbable (2)
Duration	Very Short (1)	Very Short (1)
Magnitude	Moderate (5)	Minor (2)
Significance rating	Medium (32)	Low (8)
Mitigation measures	• *Stagger component delivery to site* • *Reduce the construction period as far as possible* • *The use of mobile batch plants and quarries in close proximity to the site* • *Staff and general trips should occur outside of peak traffic periods*	
Residual Risks:	• *Noise pollution during the construction phase cannot be completely mitigated but mitigation measures will significantly reduce the impact. Noise pollution is limited to the construction period.*	

Table 8-4: Impact Rating - Operation Phase

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

Table 8-5: Impact Rating - Decommissioning Phase

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

9 CUMULATIVE IMPACTS

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

The construction and decommissioning phases are the only significant traffic generators for renewable energy projects. The duration of these phases is short term (i.e. the impact of the generated traffic on the surrounding road network is temporary and renewable energy facilities, when operational, do not add any significant traffic to the road network). Even if all renewable energy projects within the area are constructed at the same time, the roads authority will consider all applications for abnormal loads and work with all project companies to ensure that loads on the public roads are staggered and staged to ensure that the impact will be acceptable.

The assessments of cumulative impacts are collated in the table below.

Table 9-1: Cumulative Impact

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

10 ENVIRONMENTAL MANAGEMENT PROGRAM INPUTS

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

Table 10-1: EMPr Input – Construction Phase

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

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		▪ Apply for abnormal load permits prior to commencement of delivery via abnormal loads ▪ Assess the preferred route and undertake a 'dry run' to test ▪ Staff and general trips should occur outside of peak traffic periods as far as possible. ▪ Any low hanging overhead lines (lower than 5.1m) e.g. Eskom and Telkom lines, along the proposed routes will have to be moved to accommodate the abnormal load vehicles, if required			

11 CONCLUSION AND RECOMMENDATIONS

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

The potential transport related impacts for the construction and operation phases for the proposed Duneveld PV Development were assessed.

- The construction phase traffic, although significant, will be temporary and impacts are considered to have a **low significance**.
- During operation, it is expected that staff and security will periodically visit the facility. Approximately 30 full-time employees will be stationed on site. The traffic generated during this phase will be minimal and will not have an impact on the surrounding road network.

The potential mitigation measures mentioned in the construction phase are:

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

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

Access point 1 is deemed the preferred access route as it allows direct access to the proposed site and does not require additional structures to be constructed.

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

The impacts associated with Duneveld PV Development are acceptable with the implementation of the recommended mitigation measures and can therefore be authorised.

12 REFERENCES

- Google Earth Pro
- SANS 10280/NRS 041-1:2008 - Overhead Power Lines for Conditions Prevailing in South Africa
- Road Safety Act (Act No. 93 of 1996)
- The Technical Recommendations for Highways (TRH 11): “Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads

Annexure A - ASSESSMENT METHODOLOGY

ASSESSMENT METHODOLOGY

Impacts were assessed in term of the following Assessment Criteria:

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.

- The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):

- The **duration**, wherein it will be indicated whether:
    - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
    - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
    - medium-term (5–15 years) – assigned a score of 3;
    - long term (> 15 years) - assigned a score of 4; or
    - permanent - assigned a score of 5;

- The **consequences (magnitude)**, quantified on a scale from 0-10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.

- The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1–5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).

- the **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high. The **significance** is calculated by combining the criteria in the following formula:

$$S=(E+D+M)*P$$

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

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

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

- the status, which will be described as either positive, negative or neutral.

- the degree to which the impact can be reversed.

- the degree to which the impact may cause irreplaceable loss of resources.

- the degree to which the impact can be mitigated.