HOTAZEL SOLAR

PHOTOVOLTAIC FACILITY AND ASSOCIATED INFRASTRUCTURE

TRAFFIC AND TRANSPORTATION ASSESSMENT

MAY 2020

Knight Piésold CONSULTING

P O Box 381
Century City
7441
Tel. +27 21 555 0400

Rev	Description	Date
0	Issued in Draft	October 2018
1	Final Submission	November 2018
2	Amended Layout	May 2020

This report was prepared and reviewed by the undersigned.

Prepared:

Amory Le Roux-Arries
Civil Engineer

Reviewed:

Andrew Cleghorn,
Principal Civil Engineer

SPECIALIST EXPERTISE

AMORY LE ROUX-ARRIES

Profession:	Civil Engineer
Position in Firm:	Civil Engineer
Qualifications:	MEng (Civil)
Years of Experience:	12 years

Summary of Experience: Ms. Amory Le Roux-Arries has approximately nine years of engineering experience in contract administration, business development (specifically in feasibility studies), tendering, compiling business proposals and overseeing business development in West Africa. She has gained experience in the private sectors and is familiar with contractual obligations and client requirements. She has gained practical experience on road construction obligations and client requirements. She has gained practical experience on road construction and traffic engineering. Amory has recently achieved her Masters in Engineering with specialization in Traffic and Transportation Engineering.

Specialist Experience:

- **Various Traffic Impact Assessments:** Amory has completed traffic impact assessments (TIA) both in South Africa and cross border. TIAs were completed for the Gautrain Mbombela Hatfield Station, Edenburg Church rezoning, Lichtenburg Solar Farms, Hotazel Solar Farm, Augeigas Development (Namibia), Motse Development (Botswana), Lobatse Taxi rank and bus depot and Richards Bay Steelbridge.
- **City of Cape Town Facilities Management Project:** This project is for the duration of 3 years on an as and when required basis, for the upgrading, construction, installations for Facilities Management Department in the City of Cape Town region. She is responsible for the Project Management and Civil works design on various projects.
- **R53 road upgrade:** Assistant Engineer's Representative Upgrading between Parys and Potchefstroom. She was responsible for Traffic Engineering, Contract Administration, Site Supervision of this project.
- **The City Deep Kazerne Freight Hub Upgrade Programme:** Assistant Engineer's Representative Widening of Rosherville Road and the Extension of Bonsmara Road to Heidelberg Road. She was responsible for Tender Evaluation, Contract Administration, Site Supervision.
- **The Democratic Republic of Congo,Mokambo to Kasumbalesa:** she was responsible for the feasibility study, concept design of the 87km road complete with border posts and warehouses. The feasibility study included financial proposals as well as technical aspects.
- **Aveng Africa Limited – Nuclear Division:** Civil Engineer: Overseeing business development in West Africa. She was responsible for writing procedures and doing business proposals. She prepared estimation proposals of new businesses and tendering, as well as business cases for new business constructability, analysis and estimations.
- **Aveng Grinaker-LTA:** Site Engineer: Growth department and business intelligence: summaries of future projects and possible investment opportunities and Competitor analysis.

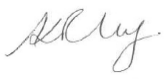
- **Grinaker-LTA Nelson Mandela Bay Soccer Stadium:** Student Engineer – Vacation Training: Verification of drawings. She was responsible for the liaison between technical manager and subcontractors and inspection checks.
- **Grinaker-LTA (Port of Ngqura Project-Coega):** Student Engineer – Vacation Training: Assisting with bridge construction. Amory handled the survey and levelling of abutments, foundation supervisor and concrete quality inspections.

SPECIALIST DECLARATION

I, **Amory Le Roux-Arries**, as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that:

- I act as the independent specialist in this application;
- I will 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;
- 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 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;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable on terms of section 24F of the Act.

Signature of Specialist:



Name of Specialist: Amory Le Roux-Arries

Date: 26 May 2020

Table of Contents

List of Figures

List of Tables

1. INTRODUCTION

Knight Piésold Consulting was appointed by ABO Wind Hotazel PV (Pty) Ltd to undertake a Traffic and Transportation Assessment for the proposal of a photovoltaic (PV) energy facility and associated infrastructure, on a site approximately 3km south east of Hotazel, in the Northern Cape Province of South Africa. This site falls within ward 4 of the Joe Morolong local Municipality in the John Taolo Gaetsewe District.

The Remaining Extent (Portion 0) of Farm York A 279 with Grid connection on Remainder of Farm 280 and Portion 11 of Farm York A 279 has been identified by the applicant (ABO Wind Hotazel PV (Pty) Ltd) as the preferred site suitable for the development of a commercial PV facility. The total assessed area of the project site is 636.8ha.

Hotazel Solar is to consist of solar photovoltaic (PV) technology with fixed, single or double axis tracking mounting structures, with a maximum generation capacity of 100MW as well as associated infrastructure, which will include:

- On-site substation / collector switching station;
- Auxiliary buildings (gatehouse and security, control centre, office, warehouse, canteen and visitors centre and staff lockers);
- Inverter stations, transformers and internal electrical reticulation;
- Access and internal road network;
- Laydown area;
- Overhead 132kV electrical distribution line / grid connection connecting to the existing Eskom Hotazel Substation;
- Rainwater tanks; and
- Perimeter fencing and security infrastructure.

1.1 Objectives of the Study

The objectives of this traffic and transportation study are to:

a. Review the study area and describe the baseline traffic conditions;
b. Determine the suitability of access to and egress from the site;
c. To evaluate the safety of the proposed accesses;
d. Address the impact of traffic generated by the proposed development, with specific reference to traffic safety, operations and road condition;
e. Propose mitigation measures for any identified significant risks or impacts and enhance positive risks or impacts of the project.

The broad methodology applied to the study is as follows:

- Site visit;
- Reviewing of the Draft Scoping report;
- Data collection and observation of existing traffic conditions;
- Data analysis;
- Liaison with client and property owners;
- Preparation of report and drawings;
- Review of comments on report;
- Amendments to report and finalisation.

1.2 Study Area

The site is located approximately 3km south east of Hotazel, in the Northern Cape Province of South Africa. This site falls within ward 4 of the Joe Morolong local Municipality in the John Taolo Gaetsewe District.

1.3 Locality

The full extent of 636.8ha of the property was assessed for the proposed project. A maximum area of 270ha (approximately 42% of total project site) is required for the development of Hotazel Solar. The PV structures will occupy a maximum area of 245ha, while the supporting infrastructure such as internal roads (20ha), auxiliary buildings (1ha), and an onsite substation (2ha) will occupy the remaining extent. The locality plan is illustrated in ***Figure 1.1*** below.

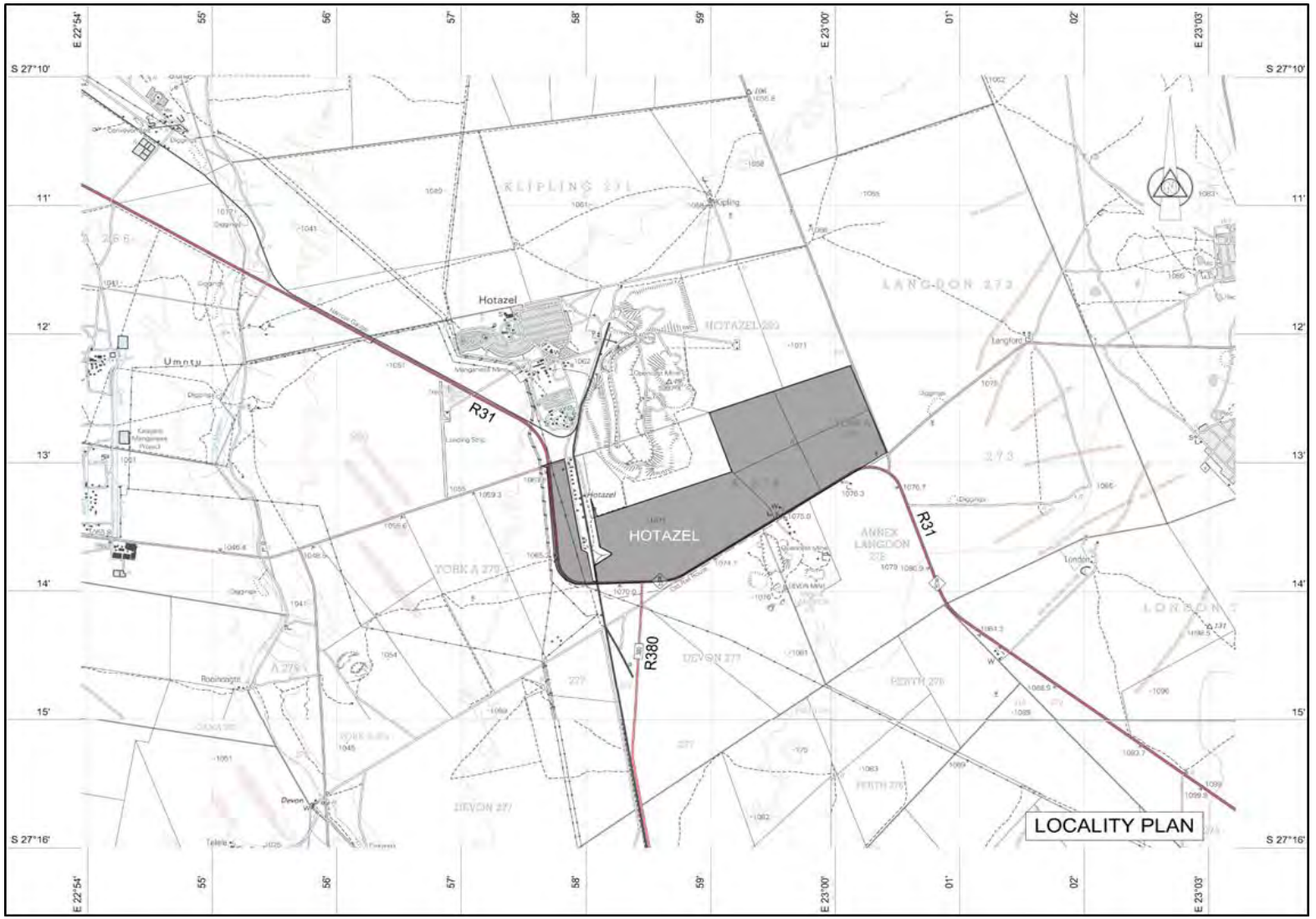


Figure 1.1: Locality Plan

2. THE DEVELOPMENT

2.1. Current and Proposed Land Use Rights

The project site is currently zoned for agricultural use. Rezoning is therefore required to a Special Zone to enable commercial use of this property. The proposed site layout is illustrated in ***Figure 2.1*** below.

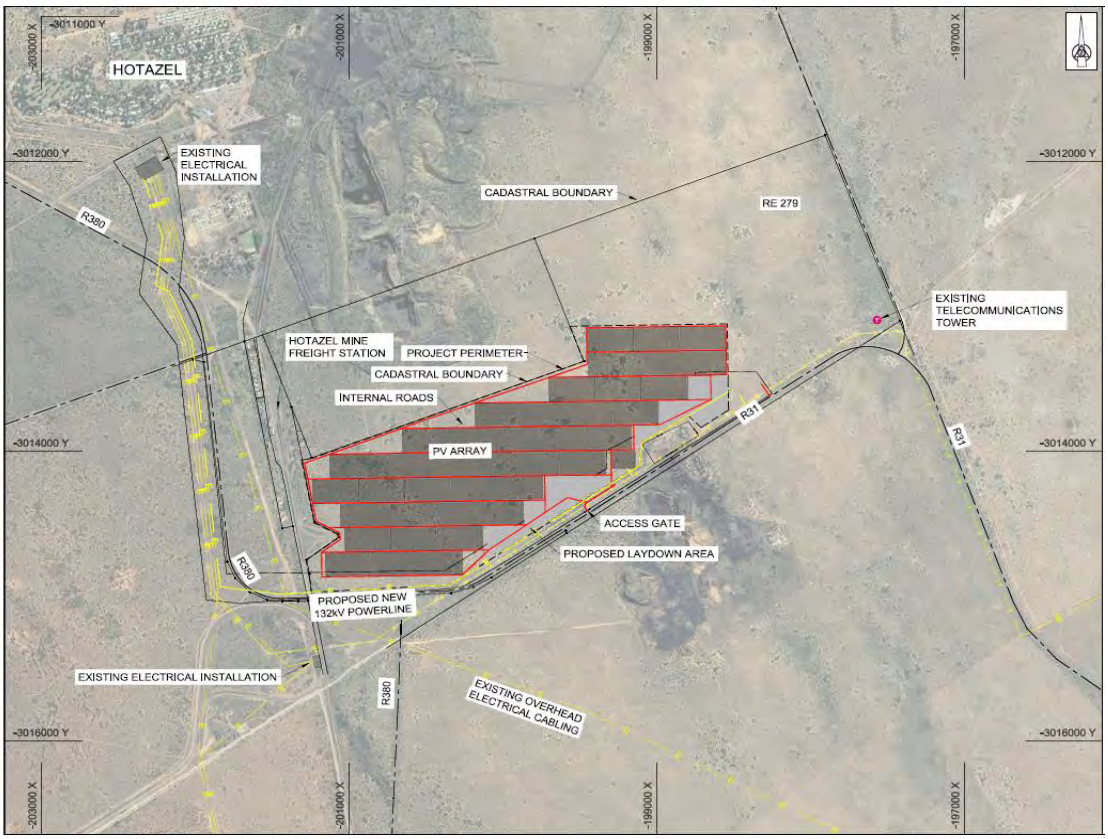


Figure 2.1: Conceptual layout of PV panels

3. ROAD NETWORK ASSESSMENT

National, regional, secondary and the proposed internal access roads will be used to transport all components and equipment required during the construction phase of the solar facility. Some of the components (e.g. substation transformer) may be defined as abnormal loads in terms of the National Road Traffic Act (No.93 of 1996), by virtue of the dimensional limitations.

The routes leading to the site, from both the preferred and alternative ports, are Provincial and National Roads.

3.1. R31

The Regional Route 31 (R31) is a single carriageway road with one lane in each direction. The lanes on this road are approximately 3.7m wide with gravel shoulders. This road connects Kimberley with the Namibian border via Kuruman and Hotazel. The current pavement condition of this road was found to be fair to good.

Photograph 3.1: Road condition R31

Photograph 3.2: Road markings on R31

3.2. R380

The Regional Route 380 (R380) is a single carriageway road with one lane in each direction. The lanes on this road are approximately 3.7m wide with gravel shoulders on both sides of the road. This road connects the town of Kathu, off the N14, to the R31. The speed limit on this road varies between 60 to 80km/h. The R380 also provides access to the Mokala Mine which is located approximately 10km south of the R31 intersection.

The current pavement condition of this road was found to be poor with large crocodile cracks, no road markings and nearly no road edge for most part of the road as shown in *Photographs 3.3 to 3.6.*

Photograph 3.3: Patching along the route

Photograph 3.4: Crocodile cracks in the pavement

Photograph 3.5: non-existing road edge

Photograph 3.6: No centreline

3.3. Current Legislation on Road Freight

The current general limitations on road freight transport are:

a. Axle load limitation of 7.7 ton on front axle and 9.0 ton on single rear axles;
b. Axle unit limitations of 18t for dual axle unit and 24t for 3 axle unit
c. The bridge formula requirements to limit load concentration and to regulate load distribution on the vehicle is as follows:
   - Permissible mass = (L * 2 100) + 18 000 kilogram
   - With L = the distance from the first axle of any axle or axle unit to the last axle of any consecutive axle or axle unit (in meters).
d. Gross vehicle mass limited to 56t. This equates to a typical payload of approximately 30t;

e. Maximum vehicle length of 22m for interlinks, 18.5m for horse and trailer and 13.5m for a single unit;
f. Width limit of 2.6m; and
g. A height limit of 4.3m.

Abnormal permits are required for vehicles exceeding any of the above limits. If, for any one of the above reasons, the equipment cannot be delivered along the preferred route, the alternate route should be considered.

3.4. Authority and Permit Requirements

For authority and permit requirements, the following should be noted:

a. Toll fees are payable on routes from the port. Toll fees for heavy vehicles with five or more axles are estimated to be R850 per trip on the preferred route.

b. A separate abnormal load permit will be required for each Provincial Authority that the abnormal load passes through. The estimated fee of these permits' ranges between R10 000 and R 17 500 per trip. The application process for these permits takes approximately four weeks to complete.

4. TRAFFIC GENERATION

4.1. Construction Phase

Imported elements are shipped to, and transported from, the nearest and most practical South African port to site. The largest potential load will be a single 100MVA transformer, with a payload of approximately 90 tons. Freight will be transported predominantly on surfaced National and Provincial roads.

Typical civil engineering construction plant, as well as other specialist equipment, will be required for site preparation, construction of the substation and mounting of the PV support structures. A temporary laydown area will be required during construction. Storage areas will be required for typical construction equipment, see ***Figure 4.1***.

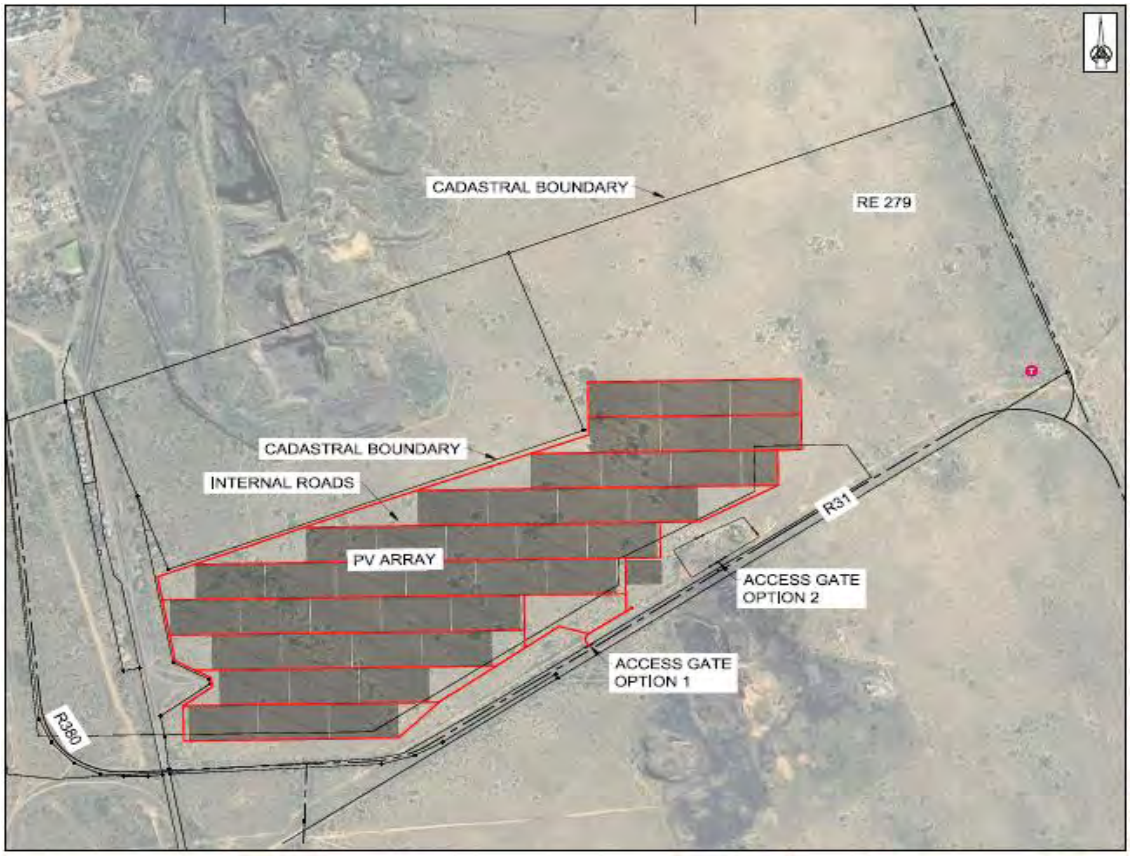


Figure 4.1: Site Areas during Construction

4.2. Traffic Statement

It is estimated that the total number of heavy vehicle trips for a 100MW installation would vary between 4 500 and 6 000. These trips would be made over an estimated construction period of between 12 and 18 months. During the peak of construction the calculated number of heavy vehicle trips would be between 15 and 25 daily of which the impact on the road network would

be negligible, as the additional peak hourly traffic would be 2 trips at most. This low volume of construction traffic will have no significant impact on the existing traffic service levels.

During the peak of the construction phase, it is estimated that approximately 400 workers would be employed on the project site. Where possible, these employees will be sourced from within 50km to 100km from the site. The nearest towns include Hotazel (3km), Deben (41km), Kathu (86km) and Kuruman (72,6km). Employees will need to be transported from the towns to site by bus or taxi. This would equate to 5-7 additional trips during the peak hours, if transported by 60-seater busses, or 20-27 additional trips if 15-seater minibus taxis are used. This may result in slight delays at the entrance to the proposed site.

4.3. Operational Phase

The proposed solar facility is expected to operate for a minimum period of 20 years and will operate 7 days a week, during daylight hours. It is assumed that once the plant is fully operational, it will employ a staff compliment of approximately 60 workers. It is also assumed that the managers, supervisors, and skilled staff will constitute 30% of the permanent workforce. This workforce will travel to work by private vehicles. Assuming vehicle occupancy of 1.2 persons per vehicle, the total trips generated per peak hour are calculated as below:

Trips per peak hour = (60 employees x 30%) / 1.2 persons per vehicle = 15 trips per hour

The total trips per day is equal to 30.

The unskilled employees will therefore constitute 70% of the total workforce. These employees will travel to work by bus or minibus taxi. Assuming vehicle occupancy of 15 persons per taxi, then the total trips generated will be calculated as follows:

Trips per peak hour = (60 employees x 70%) / 15 persons per vehicle = 3 trips per hour

The total trips per day is equal to 6.

During the operational phase, the total number of trips generated by the permanent workforce during the AM and PM hourly peak periods are therefore 18 trips per hour, respectively. No other daily trips are expected to be generated by the PV plant during the operation phase.

5. TRANSPORT STUDY

5.1. Proposed Access

Two existing gravel access roads are proposed as options to provide access from the regional road (R31), to Hotazel Solar, see ***Figure 5.1***. The current roads inside the property are informal tracks and will need to be stabilised from the R31 access point to the proposed site camp and boundary of the PV panels. Access option 1 is the preferred option for the proposed layout. Access option 2 is analysed as an alternative.

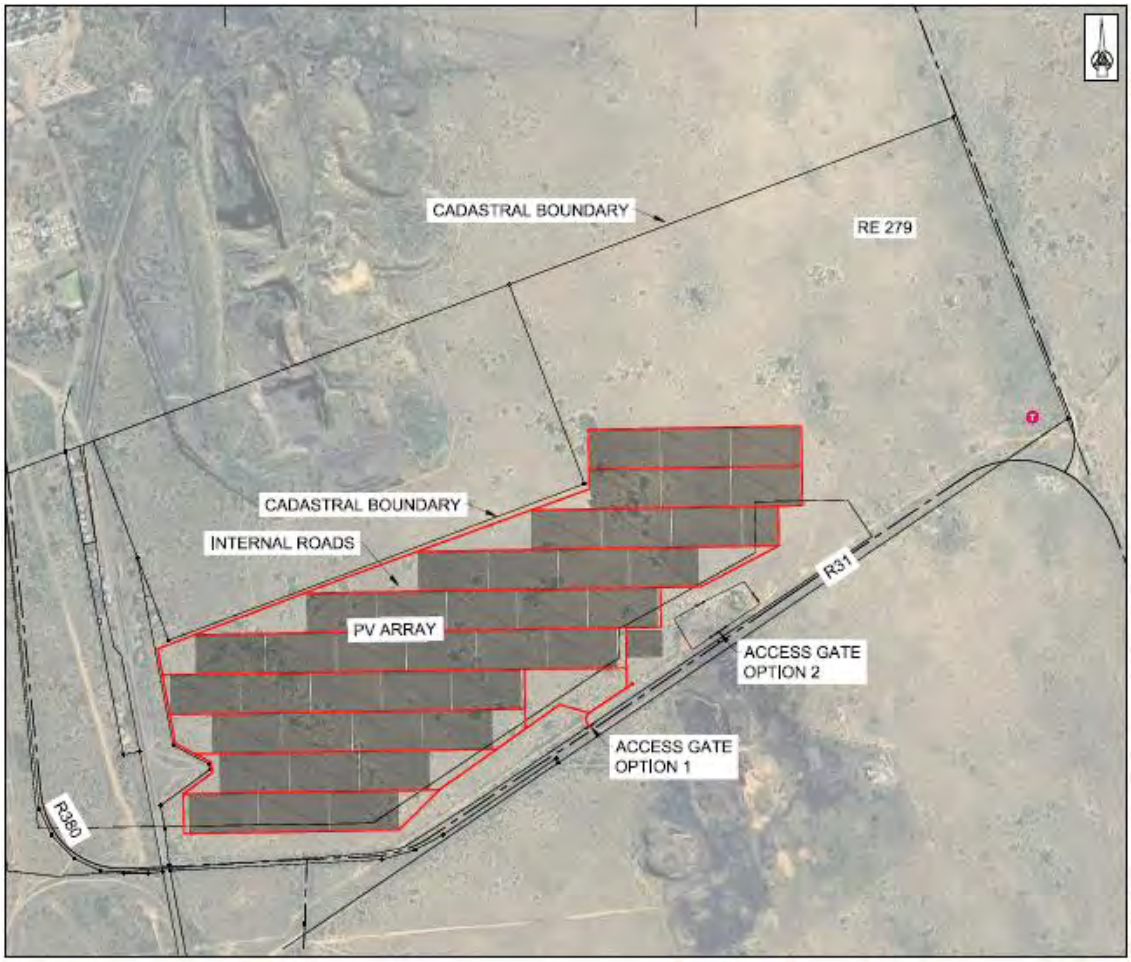


Figure 5.1: Site Access

During construction the project site will be accessed via the existing roads which will subsequently be utilised for maintenance purposes, during operation. The final site layout will determine the exact extent of the internal roads.

The first 200m of the access road (access 2), off the R31, as illustrated in *Photograph 5.1*, consists of soft sands, after which it becomes loose sand material. Prior to construction, an investigation should be undertaken to determine the measures required for stabilisation to accommodate heavy vehicles. This access road is currently 6m wide, see ***Photograph 5.1***

Access 1 is currently being used as a maintenance road by service providers. The first 300m of this access road (Access 1) consists of soft, loose sand material. This access road would require stabilisation prior to construction. This road width is currently 6m wide as illustrated in ***Photograph 5.2***.

Photograph 5.1: Access 2 off R31

Photograph 5.2: Access 1 off R31

5.2. Internal Roads

Permanent internal access roads will be constructed between the solar panels. These internal roads are generally stabilised gravel or informal tracks that are 4 to 5m wide. It is anticipated that the length of these roads will be approximately 20km.

5.3. Route from Preferred Port

The route for the transportation of imported equipment is either from Durban, Coega or Saldanha Bay. The preferred delivery route for abnormal loads, based on distance, road width and surface quality is from Durban port to site as is shown in ***Figure 5.2***. This route is 1 018km in length. The route elements are illustrated in ***Table 5.1*** below.

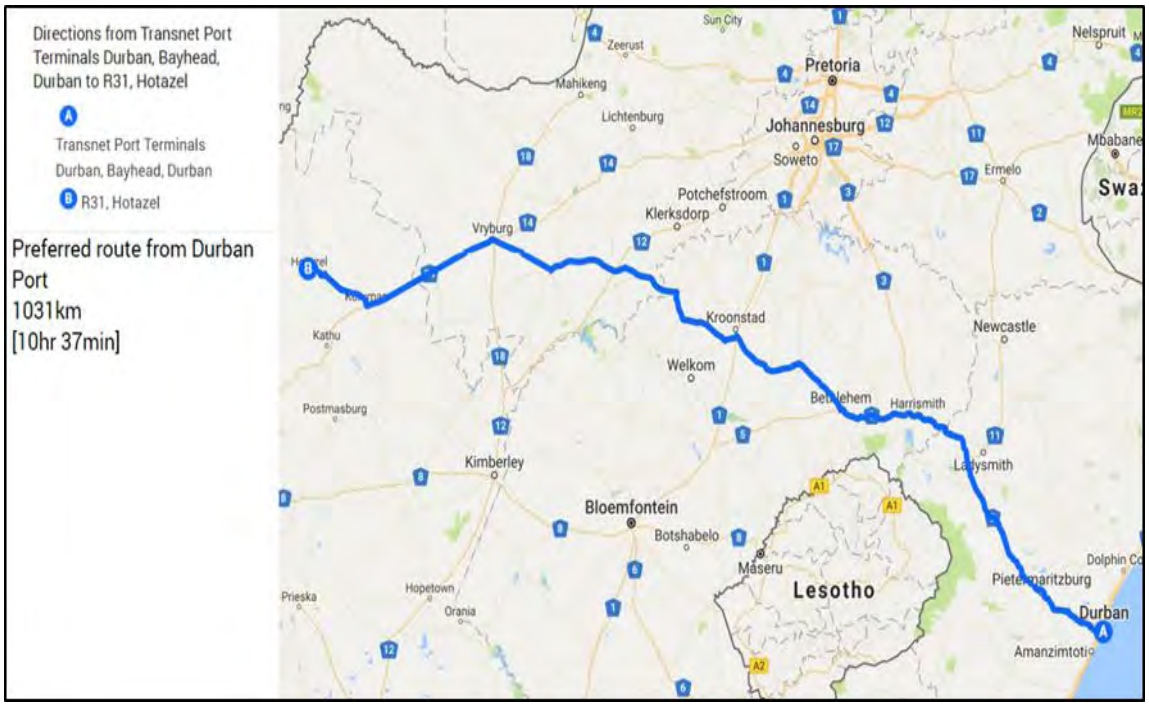


Figure 5.2: Preferred route from Durban port

Table 5.1: Preferred Route Assessment

Section	Route Name	From	To	Distance (km)	Type
1	N3	Durban	Harrismith	300	Surfaced National Road
				The N3 is a dual carriageway four lane road leaving Durban and merges into a two lane road with surfaced shoulders for the most part	
2	N5	Harrismith	Bethlehem	91,5	Surfaced National Road
				The N5 is a dual carriageway two lane road with surfaced shoulders for the most part	
3	R76	Bethlehem	Kroonstad	143	Surfaced Regional Road
				The R76 is a single carriageway two lane road with gravel shoulders	

Section	Route Name	From	To	Distance (km)	Type
4	R713	Kroonstad	Bothaville	92	Surfaced Regional Road
				The R713 is a single carriageway two lane road with gravel shoulders	
5	R504	Bothaville	Schweizer-Reneke	147	Surfaced Regional Road
				The R504 is a single carriageway two lane road with gravel shoulders	
6	R34	Schweizer-Reneke	Vryburg	62	Surfaced Regional Road
				The R34 is a single carriageway two lane road with gravel shoulders	

<table>
<tr><th>Section</th><th>Route Name</th><th>From</th><th>To</th><th>Distance (km)</th><th>Type</th></tr>
<tr><td>7</td><td>N14</td><td>Vryburg</td><td>Kuruman</td><td>144</td><td>Surfaced Regional Road</td></tr>
<tr><td></td><td colspan="3">  </td><td colspan="2">The N14 is a single carriageway two lane road with gravel shoulders for the most part</td></tr>
<tr><td>8</td><td>R31</td><td>Kuruman</td><td>Site</td><td>73.2</td><td>Surfaced Regional Road</td></tr>
<tr><td></td><td colspan="3">  </td><td colspan="2">The R31 is a single carriageway two lane road with surfaced shoulders for the most part</td></tr>
</table>

5.4. Route from first Alternative Port

The first alternative port to have equipment delivered would be Coega port, which is 1 040km from site, shown in ***Figure 5.3***. The existing road elements are illustrated in ***Table 5.2*** below:

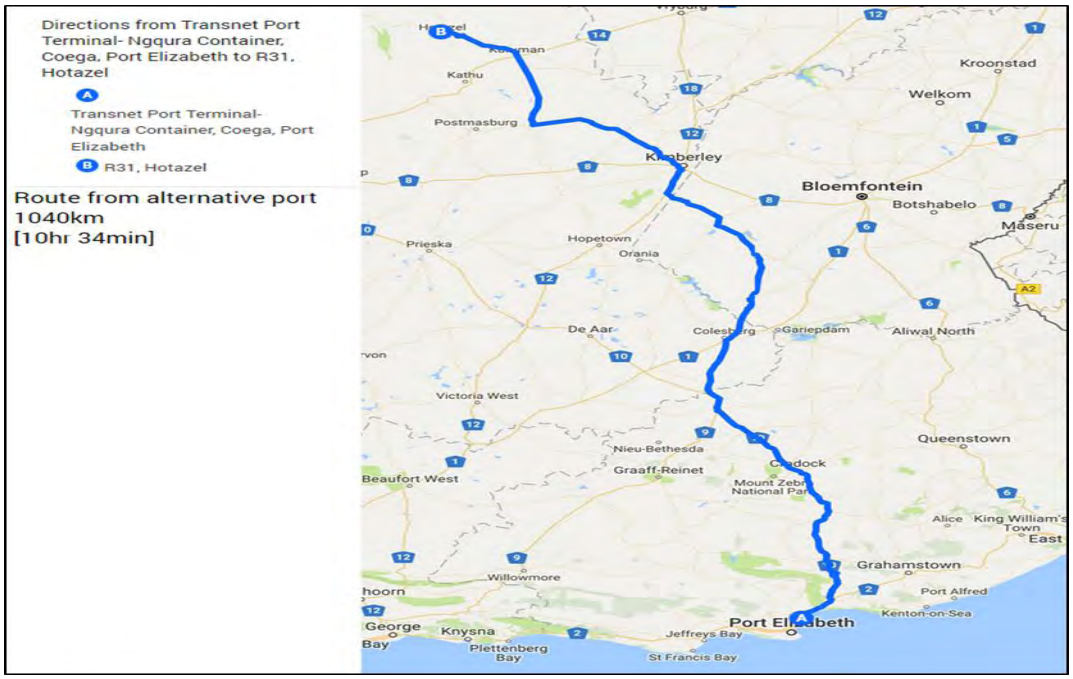
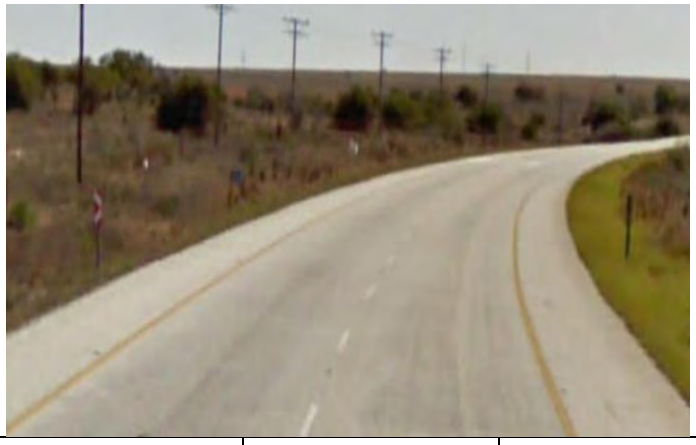


Figure 5.3: Route from alternative 1 Port

Table 5.2 Route Elements from Alternative 1 Port

Section	Route Name	From	To	Distance (km)	Type
1	N2	Port of Coega	N9/N10 intersection	32	Surfaced National Road
					The N2 is a two lane dual carriageway which merges into a one lane in each direction single carriageway with surfaced shoulders.

<table>
<tr><th>Section</th><th>Route Name</th><th>From</th><th>To</th><th>Distance (km)</th><th>Type</th></tr>
<tr><td>2</td><td>N10</td><td>N9/N10 intersection</td><td>Colesberg</td><td>312</td><td>Surfaced National Road</td></tr>
<tr><td></td><td colspan="3">  </td><td colspan="2">The N10 is a single carriageway two lane road with gravel shoulders</td></tr>
<tr><td>3</td><td>R717</td><td>Colesberg</td><td>Kimberley</td><td>277</td><td>Surfaced National Road</td></tr>
<tr><td></td><td colspan="3">  </td><td colspan="2">The R717 is a single carriageway two lane road with gravel shoulders.</td></tr>
<tr><td>4</td><td>R31</td><td>Kimberley</td><td>Site</td><td>73.2</td><td>Surfaced Regional Road</td></tr>
<tr><td></td><td colspan="3">  </td><td colspan="2">The R31 is a two lane single carriageway, with surfaced shoulders for the most part.</td></tr>
</table>

5.5. Route from Second Alternative Port

The second alternative port to have equipment delivered is Saldanha Bay port, which is a distance of 1 059km from site, as shown in ***Figure 5.4***. The existing road elements are illustrated in ***Table 5.3*** below:

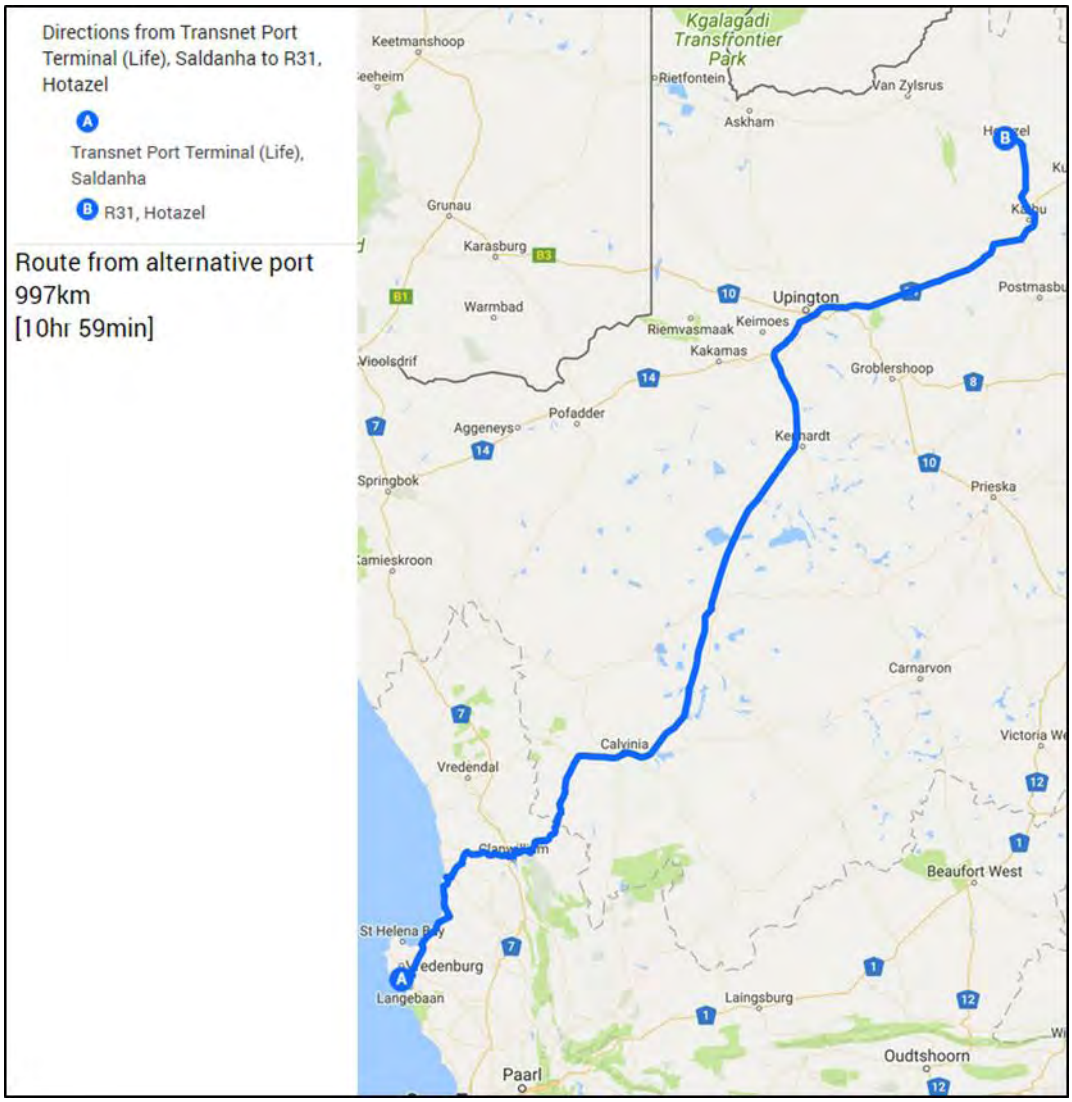


Figure 5.4: Route from alternative 2 port

Table 5.3 Route Elements from Alternative 2 Port

Section	Route Name	From	To	Distance (km)	Type
1	R27	Port of Saldanha	Neilersdrift	245	Surfaced Regional Road
				The R27 is a single carriageway with surfaced shoulders for the most part. This road leads via the R364	
2	N14	Neilersdrift	Kuruman	191	Surfaced Regional Road
				The N14 is a two lane single carriageway with gravel shoulders for the most part. Reduced surfaced shoulders are found along the rest of the road.	
3	R31	Kuruman	Site	73.2	Surfaced Regional Road
				The R31 is a two lane single carriageway, with surfaced shoulders for the most part.	

5.6. Route for Road Construction Materials

The materials required for road construction are available in Kuruman, which is located 69 km from site. All materials can be transported from here and surrounding towns to site, on any of the National and Provincial roads. If any materials are not locally available, they would have to be sourced and transported from major towns such as Johannesburg, Kimberley or Cape Town. These materials can be transported from any of the major cities on the National and Provincial roads, with no limitations imposed on normal freight.

6. CONCLUSIONS

It was observed during the site inspection that the R31 road within the study area is functioning at an acceptable level of service, while the R380 which also leads to site is in very poor condition. Therefore, the R380 should not be used for heavy vehicle transport.

No congestion problems, queue delays and delays were evident on the surrounding network. The surrounding network has the capacity to accommodate the additional volumes of 2 trips per hour for the construction vehicles, as well 15 to 25 bus trips required to transport employees during peak hours.

The additional 18 trips during the operational phase of this proposed development can also be accommodated. If minibus taxis are used for the transportation of employees instead of buses, the additional trips generated will then increase to between 20 and 27 during the peak period. The mitigation measure for this would be to create bus drop-off points at the mine dumps located on the R31.

Dust could pose a potential health risk to people as well as animals in the vicinity of the site during the construction phase of the development and must be addressed in the risk assessment during each phase of the project.