ATLANTIC RENEWABLE ENERGY PARTNERS (PTY) LIMITED

TECHNICAL LAYOUT DEVELOPMENT REPORT FOR THE HOTAZEL SOLAR FACILITY

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Prepared for:

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1. INTRODUCTION

ABO Wind Hotazel PV (Pty) Ltd is proposing the establishment of a commercial photovoltaic (PV) solar energy facility (SEF), called Hotazel Solar, on the farm known as the Remaining Extent (Portion 0) of the farm York A 279, situated in the District of Hotazel in the Northern Cape Province (the "Property").

The technology under consideration is photovoltaic (PV) modules mounted on either fixed-tilt or tracking structures. Other infrastructure includes inverter stations, internal electrical reticulation, internal roads, a facility switching station / substation, a 132 kV overhead distribution line (OHL), auxiliary buildings, construction laydown areas, perimeter fencing, and security infrastructure. The facility switching station / substation will locate the main power transformer/s that will step up the generated electricity to a suitable voltage level for transmission into the national electricity grid, via the OHL. Auxiliary buildings include, inter alia, a control building, offices, warehouses, a canteen and visitors centre, staff lockers and ablution facilities and gate house and security offices.

Figure 1 below depicts a typical layout of a solar PV energy facility.

Figure 1: Typical Layout of a Solar PV Energy Facility
(THE MILLION SOLAR ROOF INITIATIVE – SOLAR SALVATION OR SOLAR SCAM? CALIFORNIA PV SOLAR FARMS – A BITTER HARVEST!, 2014)

Hotazel Solar will have a net output of 100 MW_{AC} with an estimated maximum footprint of ± 275 ha. The approximate area that each component of the SEF will occupy is summarised in Table 1 below.

SEF Component	Estimated Area	% of Total Area (± 230 ha)	% of Farm Area (636.7946 ha)
PV structures/modules	± 250 ha	90.91%	39.26 %
Internal roads	± 18 ha	6.55 %	2.83 %
Auxiliary buildings	± 1 ha	0.36 %	0.16 %
Substation	± 1 ha	0.36 %	0.16 %
Other	± 5 ha	1.82 %	0.78 %

2. LAYOUT DEVELOPMENT

It is customary to develop the final / detailed construction layout of the SEF only once an Independent Power Producer (IPP) is awarded a successful bid under the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), after which major contracts are negotiated and final equipment suppliers identified. However, for the purpose of the Draft Scoping Report (DSR) in accordance with the minimum requirements prescribed by the Department of Environmental Affairs (DEA), two alternative layouts were identified. The following section elaborates on the layout options for the Hotazel Solar facility.

2.1 INITIAL ASSESSMENT AREA

The Remaining Extent (Portion 0) of the farm York A 279 is highlighted in yellow in Figure 2 below.

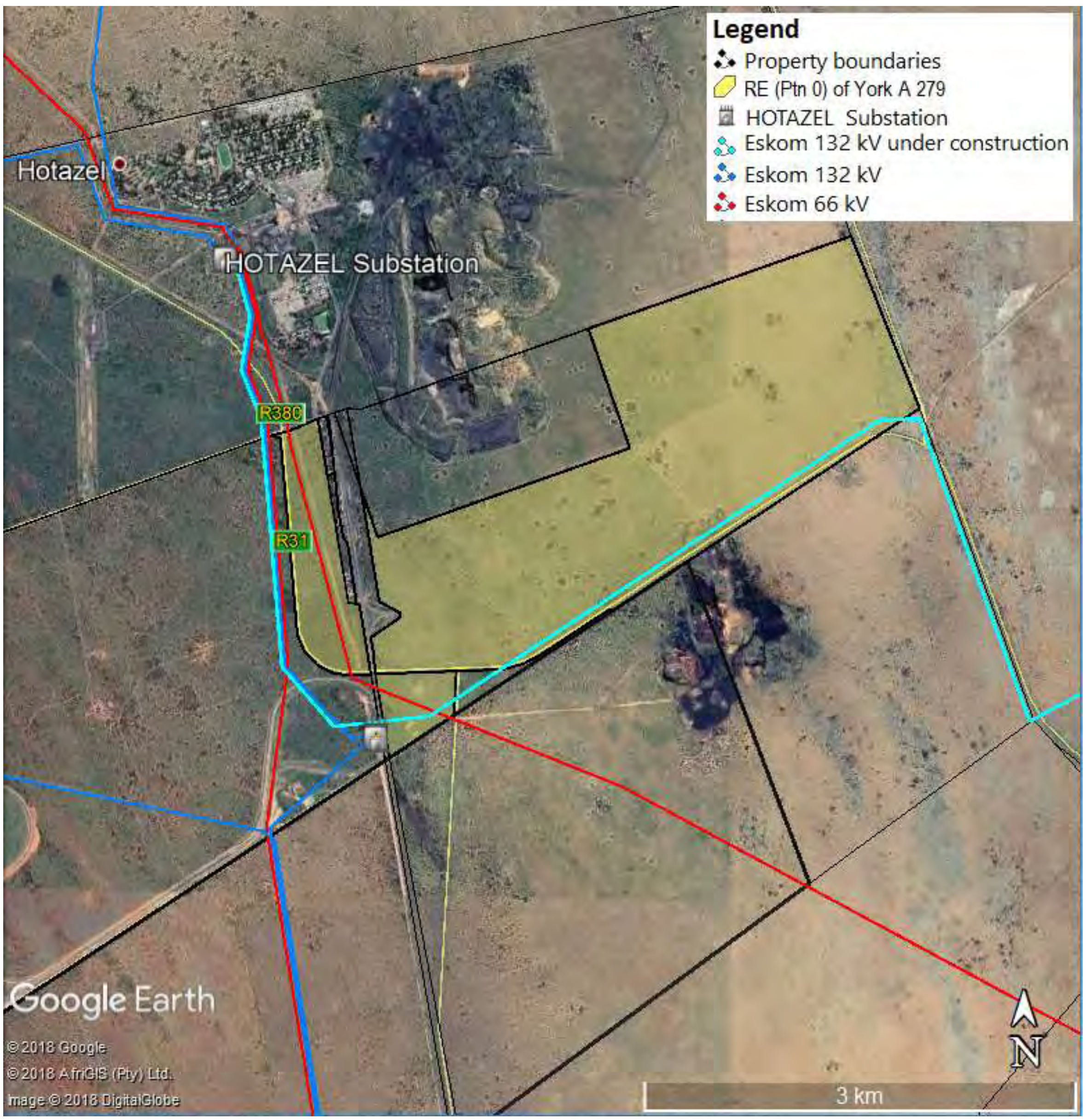

Figure 2: Locality of the Property

An initial/ conceptual area of ± 450 ha was identified for the ecologist to assess during his site visit in the initiation phase of the EIA (Scoping) for Hotazel Solar; this area is shown outlined in white on Figure 3.

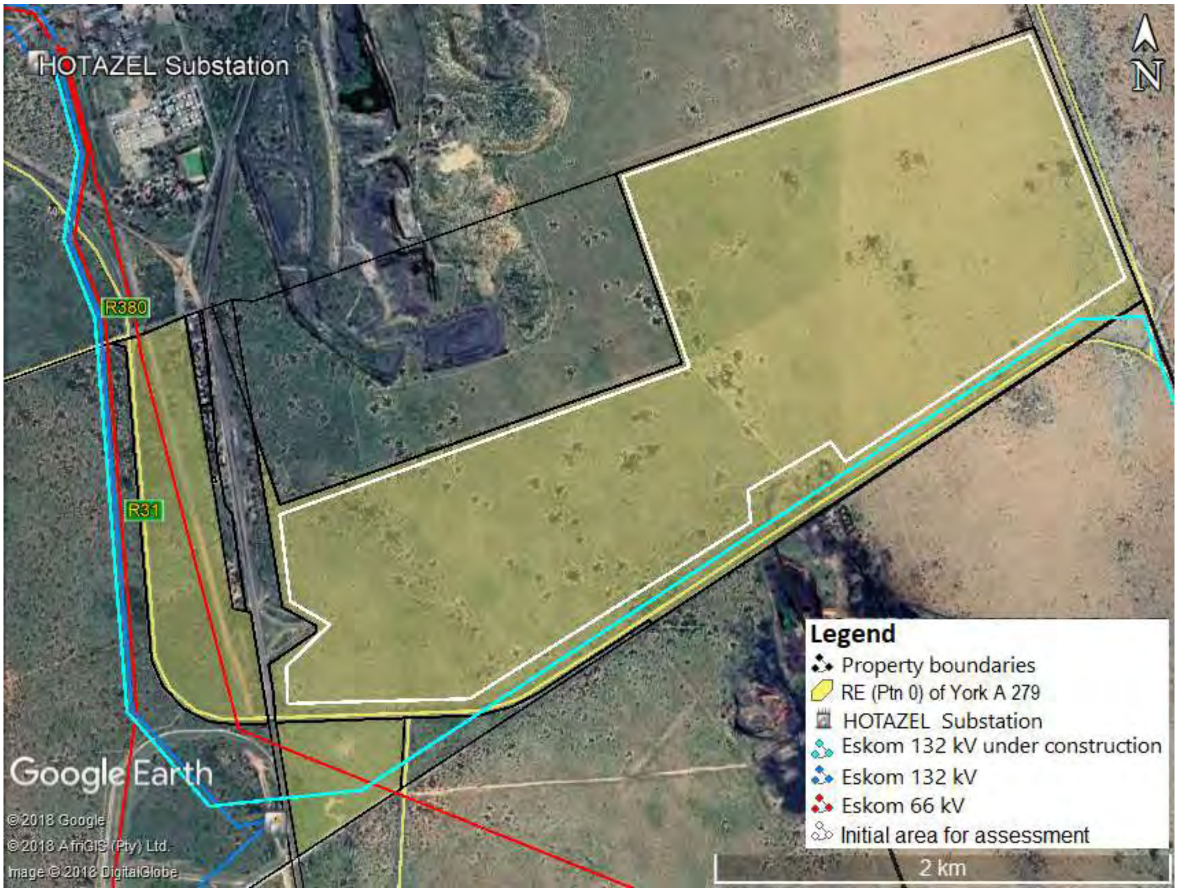

Figure 3: Initial/ Conceptual Area

This initial/ conceptual area only considered the power lines over the Property, and the regional roads that segment the property into three sections and was thus driven primarily by its undivided space. The initial/ conceptual area did not consider any environmental sensitive areas (to be identified by the various specialist studies). Following the identification of the initial/ conceptual area, an ecological expert, Mr Simon Todd, was appointed to assess the area and advise suitable areas for the location of the SEF; these are discussed in section 2.2

2.2 LAYOUT ALTERNATIVES

Layout Alternative 1 is depicted in Figure 4. Layout Alternative 1 constitutes a preliminary layout area within the initial/ conceptual area restricted to the east of the Property.

Layout Alternative 2 is shown in Figure 5. Layout Alternative includes a bit more sensitive habitat in the west with a higher abundance of Acacia haematoxylon, however it would have a shorter grid connection to the Hotazel substation.

The ecologist advised that the far west and far eastern sides of the site should be avoided as these areas have a high tree density.

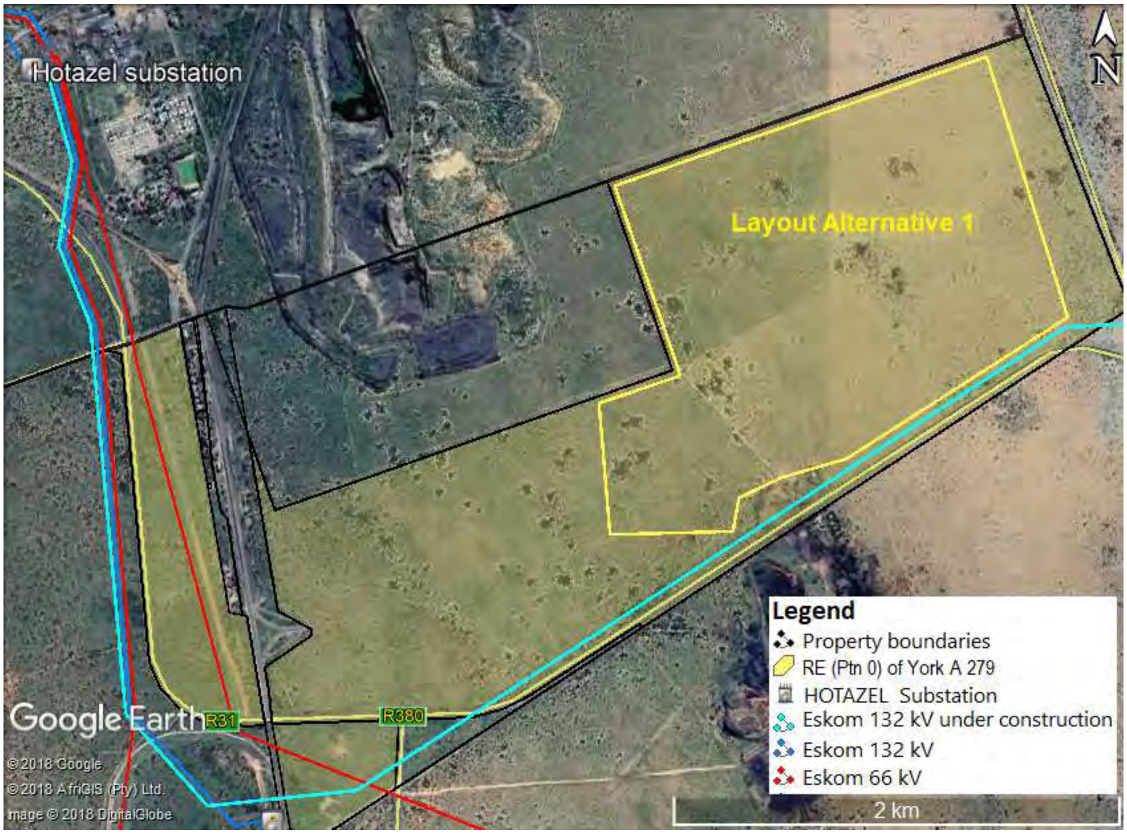

Figure 4: Layout Alternative 1

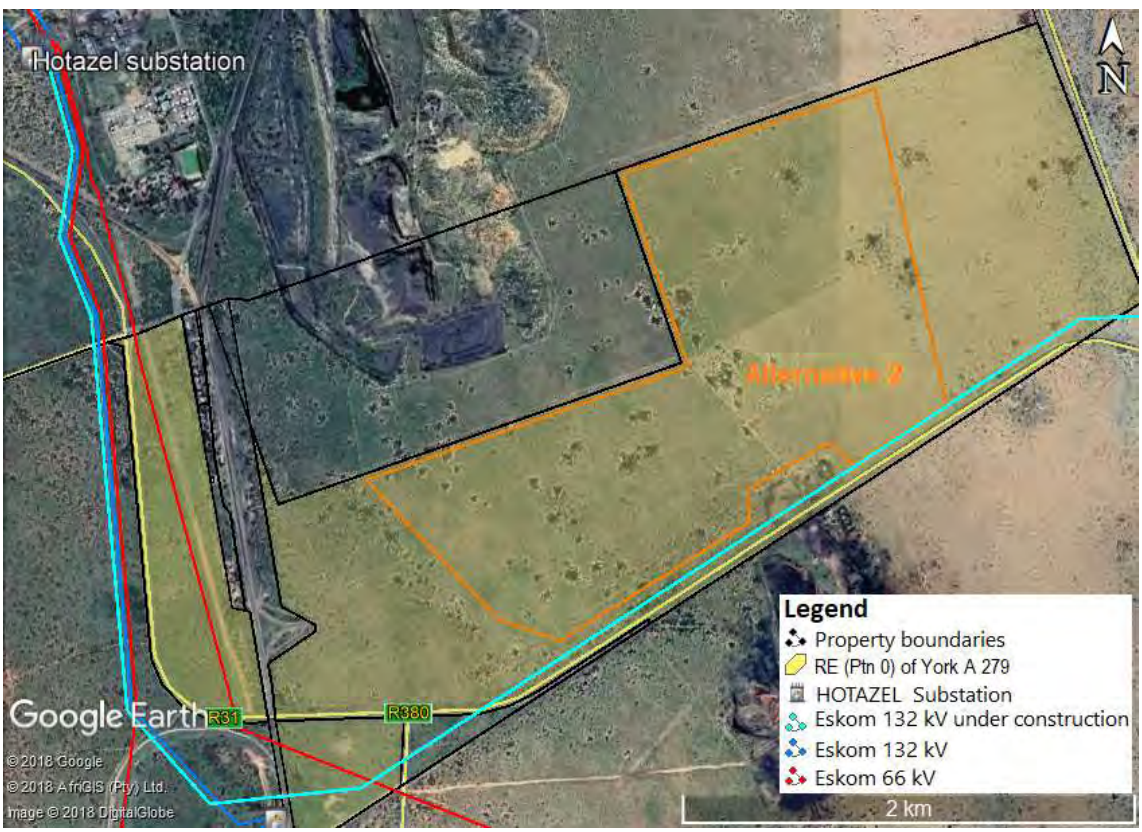

Figure 5: Layout Alternative 2

3. OVERVIEW OF THE SOLAR ENERGY FACILITY

The following section presents an overview of the main components of the solar energy facility layout.

3.1 SOLAR ARRAY

Solar PV modules are connected in series to form a string. A number of strings are then wired in parallel to form an array of modules. PV modules are mounted on structures that are either fixed, north-facing at a defined angle, or mounted to a single or double axis tracker to optimise electricity yield.

3.2 MOUNTING STRUCTURES

Various options exist for mounting structure foundations, which include cast / pre-cast concrete (shown in Figure 6), driven / rammed piles (Figure 7), or ground / earth screws mounting systems (Figure 8).

Figure 6: Cast Concrete Foundation
(Solar Power Plant Business, 2013)

Figure 7: Driven/ Rammed Steel Pile
(SolarPro, 2010)

Figure 8: Ground Screw
(PV MAGAZINE, 2014)

The impact on agricultural resources and production of these options are considered to be the same, however concrete is least preferred due the effort required at a decommissioning phase in order to remove the concrete from the soil, and therefore its impact on the environment. The Hotazel Solar facility will therefore aim to make the most use of either driven / rammed piles, or ground / earth screws mounting systems, and only in certain instances resort to concrete foundations should geotechnical studies necessitate this.

3.3 AUXILIARY BUILDINGS

The auxiliary buildings will comprise of the following as a minimum:

- Control Building / Centre (± 31m x 8m);
- Office (± 22m x 11m);
- 2 x Warehouses (each ± 50m x 20m);
- Canteen & Visitors Centre (± 30m x 10m);
- Staff Lockers & Ablution (± 22m x 11m); and
- Gate house / security offices (± 6m x 6m).

The total area occupied is approximately 0.31 ha, excluding the facility switching station/ substation.

3.4 GRID CONNECTION AND CABLING

It is proposed to connect the SEF directly to Eskom's Hotazel Substation located ± 3km to the north west of the Property. The SEF switching station/ substation will be approximately 100m x 100m in size and feature a step-up transformer/s to transmit electricity via a 132 kV OHL directly to the Hotazel Substation. Depending on which layout alternative is selected, there are options for the SEF switching station/ substation location, and the OHL routing to the Hotazel Substation, as shown below in Figure 9.

The longest OHL alternative (Alternative C from Substation Alternative B) is ± 6km in length. The OHL will be a maximum height of 24m and occupy a servitude width of between 31m – 51m.

A 100 MW_{AC} installation will require specific electrical components to meet the national grid code requirements in order to generate and supply electricity into the national grid. The conversion from DC (modules) to AC is achieved by means of inverter stations. A single inverter station is connected to a number of solar arrays, are will be placed along the internal service roads for ease of access. A number of inverter stations will be installed for the SEF (up to maximum of ± 80 centralised inverters, or a maximum of ± 1120 string inverters), each of which is connected to the facility switching station/ substation.

Final placement of the inverter stations and facility switching station/ substation will need to take ground conditions into consideration. Interconnecting electrical cabling will be trenched where practical and follow internal access roads to the greatest extent. Sensitive areas will consequently be avoided as far as possible, or alternatively, cables will be fastened above- ground to the mounting structures so as to avoid excessive excavation works and clearing of vegetation.

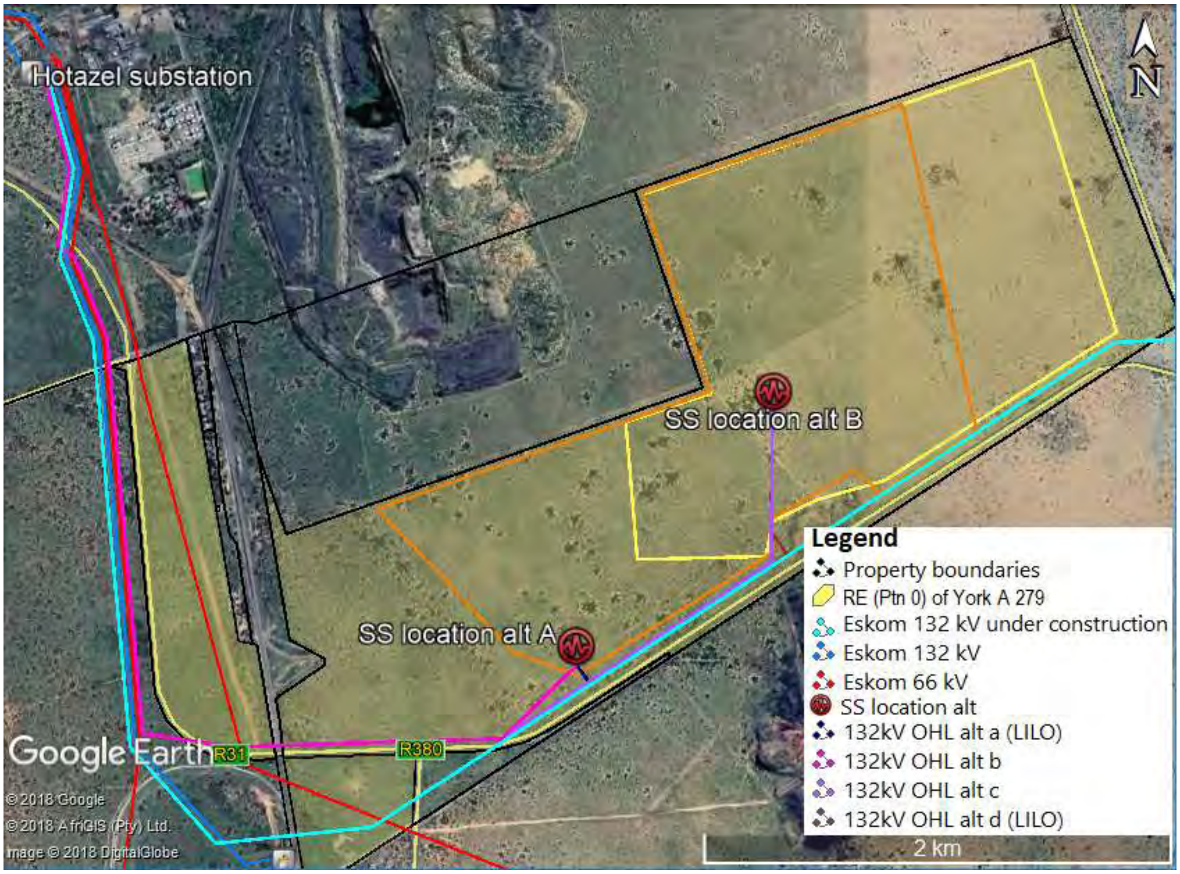

Figure 9: Grid Connection Alternatives

3.5 CONSTRUCTION OF ROADS

The internal road network of the SEF will be gravelled roads, approximately 4 – 5m in width, around the solar array periphery. Roads located in-between the solar modules will be un-surfaced tracks to be used for maintenance and cleaning of solar PV panels.

Precautionary measures will be taken to mitigate the risk of ground disturbances where access roads will be constructed. Special attention will be given to drainage, water flow and erosion by applying appropriate building methods.

A detailed transport and traffic plan will be undertaken during the EIA phase of the project to determine the best route to site. Depending on the layout alternative that is selected, there are two existing access points that could be used for the SEF, as depicted in Figure 10 below. The main access road will not exceed 8m in width.

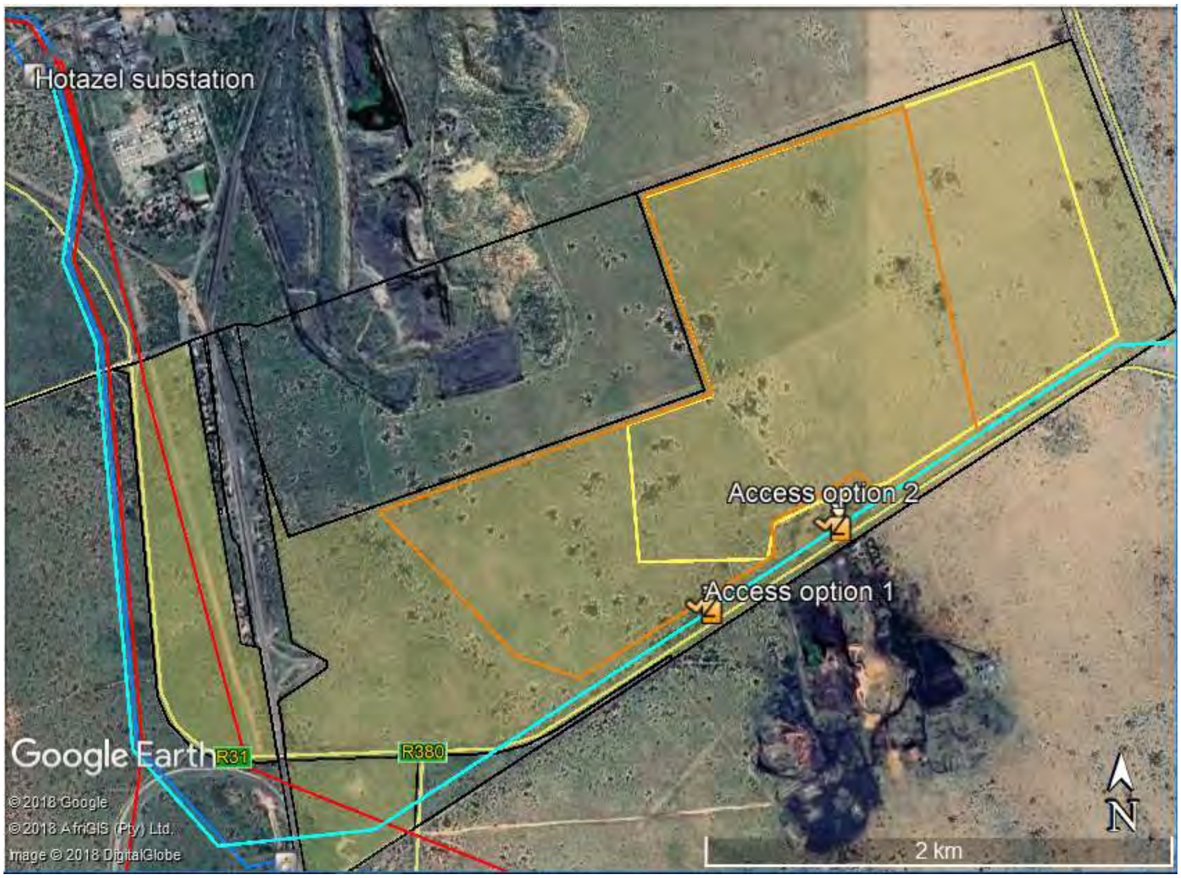

Figure 10: Access Options

4 CONCLUSION

At this preliminary EIA stage, neither layout alternative has been determined as preferred. Further assessment during the scoping and impact assessment phases will inform the selection of which layout alternative is preferred.

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