ATLANTIC RENEWABLE ENERGY PARTNERS (PTY) LIMITED

TECHNICAL LAYOUT DEVELOPMENT REPORT FOR BLOEMSMOND 5

(PV Magazine, 2018)

Prepared for:

Cape Environmental Assessment Practitioners (Pty) Ltd

Date: 15 July 2019

Contact Person:

Peter Smith

Atlantic Energy Partners
101, Block A, West Quay Building 7
West Quay Road
Waterfront, 8000

F: + 27 (0) 86 515 1466
L: +27 (0) 21 418 2596
E: peter@atlanticep.com

DOCUMENT HISTORY

REVISION HISTORY

Revision No	Revision Date	Author
Draft	03 June 2019	Peter Smith
Final	30 July 2019	Peter Smith
Revision 1		Peter Smith
Revision 2		Peter Smith

APPROVAL FOR RELEASE

Name	Title	Signed
David Peinke	Director	

DISTRIBUTION

Name	Designation	Company
Dale Holder	EAP	Cape EAPrac
Anthony De Graaf	Director	AEP
Craig Stanley	Director	AEP

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

2019/197457/07 (SOUTH AFRICA) (Pty) Ltd is proposing the establishment of a commercial photovoltaic (PV) solar energy facility (SEF), called Bloemsmond 5, located on Portions 5 and 14 of Bloemsmond Farm No.455, which is located approximately 30 km south west of Upington and 16 km north east of Keimoes in the Kai!Garib Local Municipality (ZF Mgcawu District Municipality) in the Northern Cape, hereinafter referred to as the Site.

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)

Bloemsmond 5 will have a net generating capacity of 100 MW_{AC} with an estimated maximum footprint of ± 280 ha. The approximate area that each component of the SEF will occupy is summarised in Table 1 below.

Table 1: Component Areas and % of Total Project Area

SEF Component	Estimated Area	% of Total Area (± 280ha)	% of Farm Area (4829.8239 ha)
PV array	± 263 ha	94.20 %	5.4 %
Permanent and construction laydown areas	± 4.5 ha	1.6 %	0.09%
Auxiliary buildings	± 1 ha	0.3 %	0.02 %
Internal roads	± 10 ha	3.5 %	0.21 %
Substation	± 1.5 ha	0.53 %	0.03 %

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 Basic Assessment Report (BAR) 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 Bloemsmond 5.

2.1 INITIAL ASSESSMENT AREA

An initial/ conceptual area of ± 390 ha was identified during the initiation phase of the EIA (BAR) for Bloemsmond 5. The area is located in the south eastern corner of Portion 14 of Bloemsmond Farm 455. Figure 2 below depicts the 390 ha initial/conceptual area outlined in green.

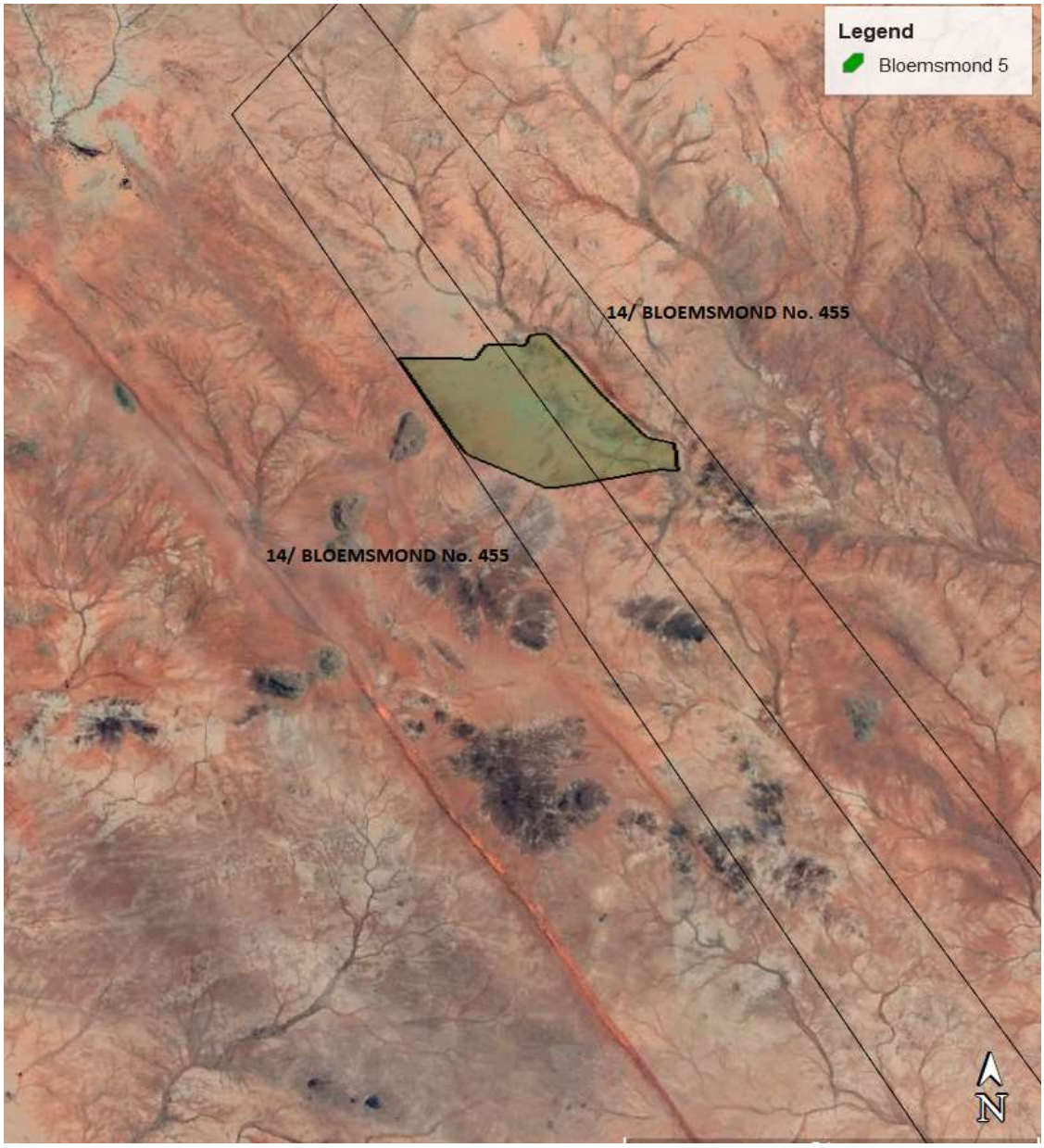

Figure 2: Initial/ Conceptual Area

This initial/ conceptual area only considered the already authorised solar facilities on the properties, namely AEP Bloemsmond 1 (DEA 14/12/16/3/3/2/815) and AEP Bloemsmond 2 (DEA 14/12/16/3/3/2/816), the existing Eskom 400kV line that runs through both properties, as well as the area under assessment as part of another EIA application (shown in light purple in Figure 2).

The initial/ conceptual area did not consider any environmental sensitive areas (to be identified by the various specialist studies). This initial / conceptual area was driven primarily by its proximity to the N14 access road as well as reduced OHL distance to connect into the Upington MTS, located ± 10.5 km to the east of the site.

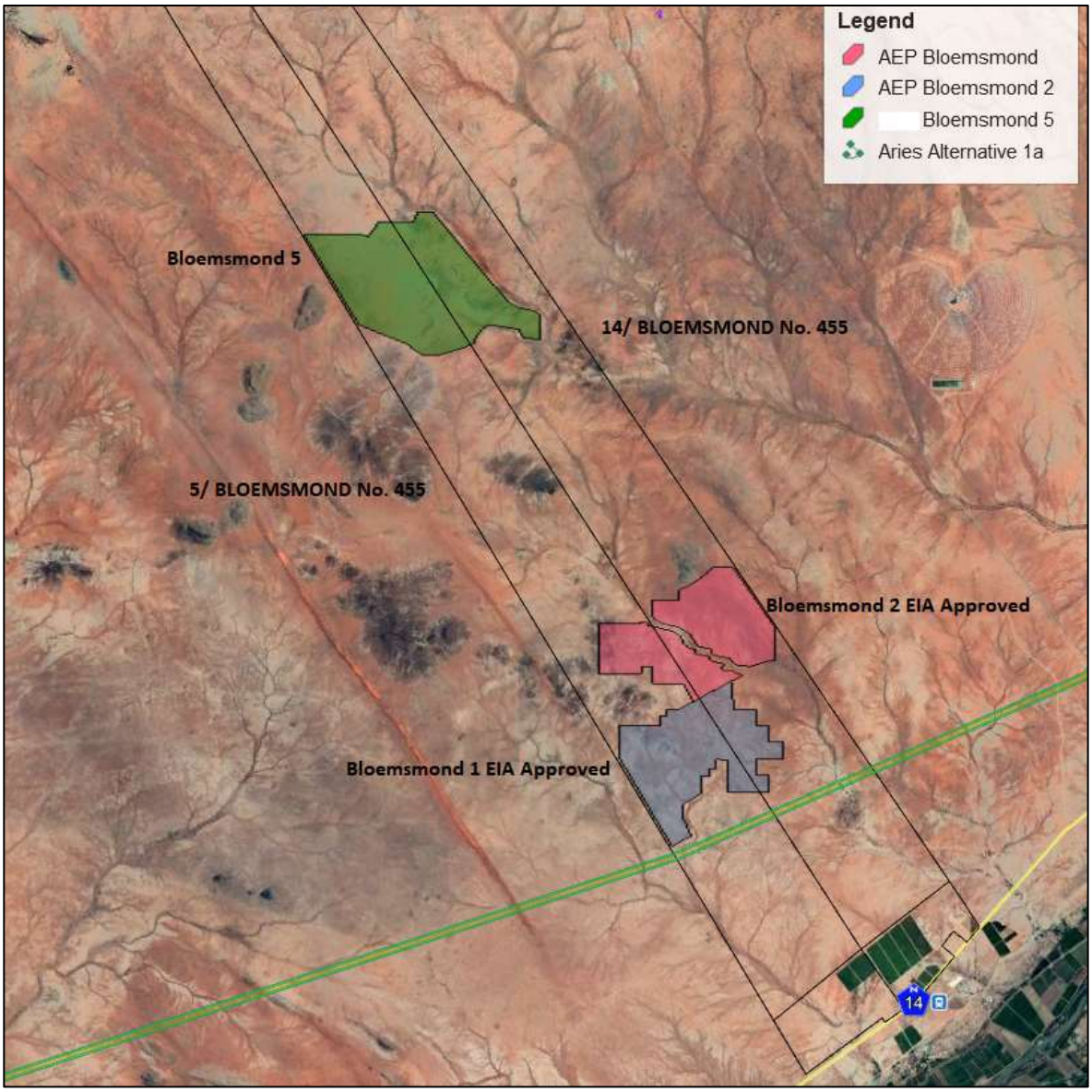

Figure 3: Approved projects on Bloemsmond Farm 455 Portions 5 & 14.

2.2 SITE SENSITIVITY SCREENING

Following the identification of the initial/conceptual area, various specialists namely ecological, aquatic and avifaunal were appointed to assist in the site selection process in the form of mapping the sensitive area of the initial/conceptual area following a site visit. This sensitivity files were then used to determine the location of the preferred layout alternative during the planning and design phase, which aimed to avoid all areas with a medium – high, high and very high sensitivity as indicated in Figure 3 below.

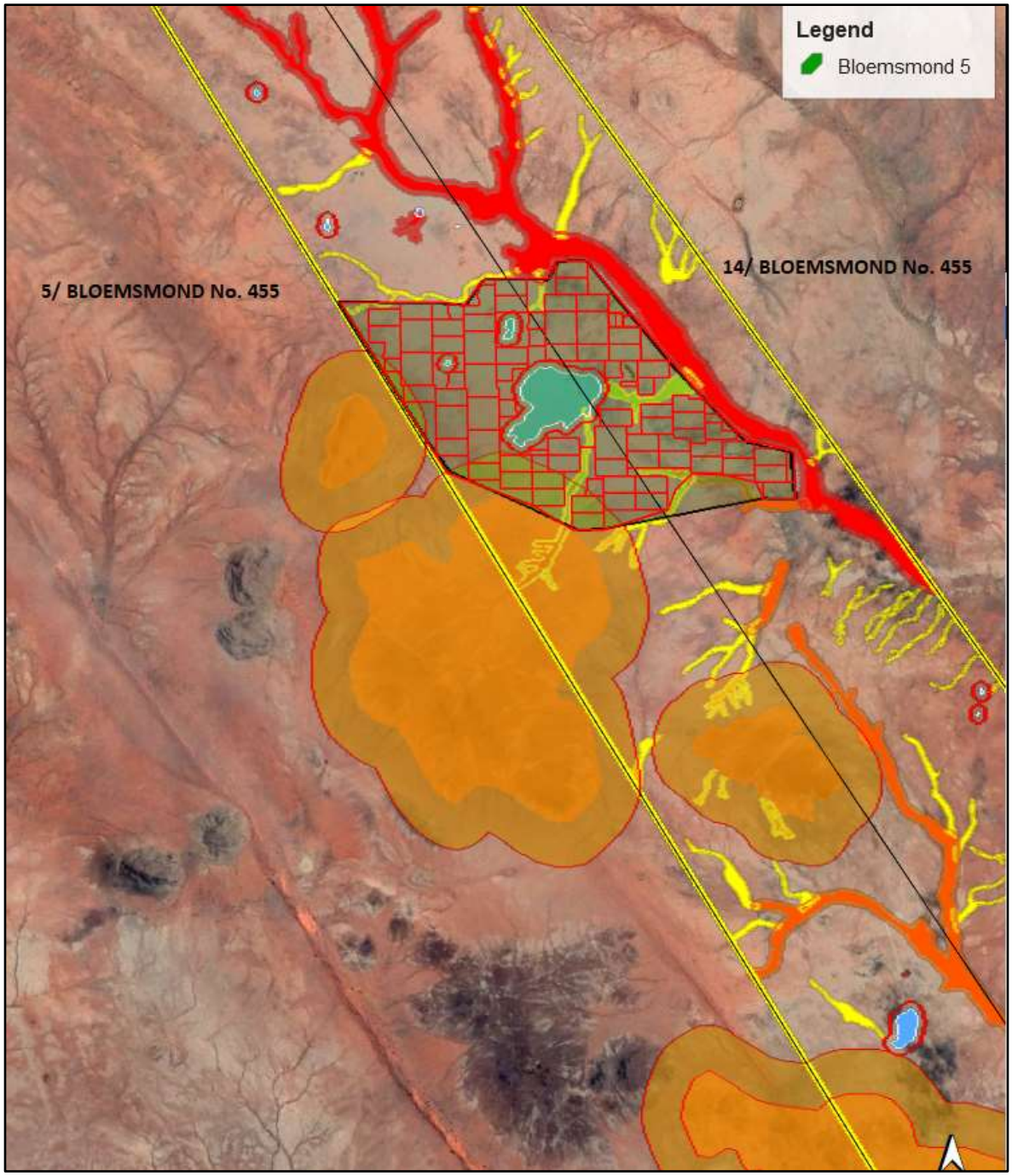

Figure 4: Ecological Sensitivity for Bloemsmond 5 located on Portions 14 of Bloemsmond 455.

2.3 LAYOUT ALTERNATIVE 1 (PREFERRED)

The preferred layout alternative considered during the preliminary planning phase of the EIA is depicted in Figure 3 above Layout Alternative 1 (Preferred) constitutes a preliminary layout area within the initial/ conceptual area, however this area has been decreased due to the very high sensitivity pans, watercourses, heritage areas and koppies identified by the respective specialists during the assessment of the initial/ conceptual area. Layout Alternative 1 predominantly occupies only Low/Medium sensitivity areas.

2.3 LAYOUT ALTERNATIVE 2

In accordance with the minimum requirements prescribed by the DEA, a second layout option was identified. Layout Alternative 2 is shown in Figure 5 below. Layout Alternative 2 is located towards the norther section of Bloemsmond Farm 455 Portions 5 & 14. This alternative is considered the least preferred due to its High sensitivity area in terms several watercourses within the site boundary combined with its proximity from the main N14 access road and the Upington MTS.

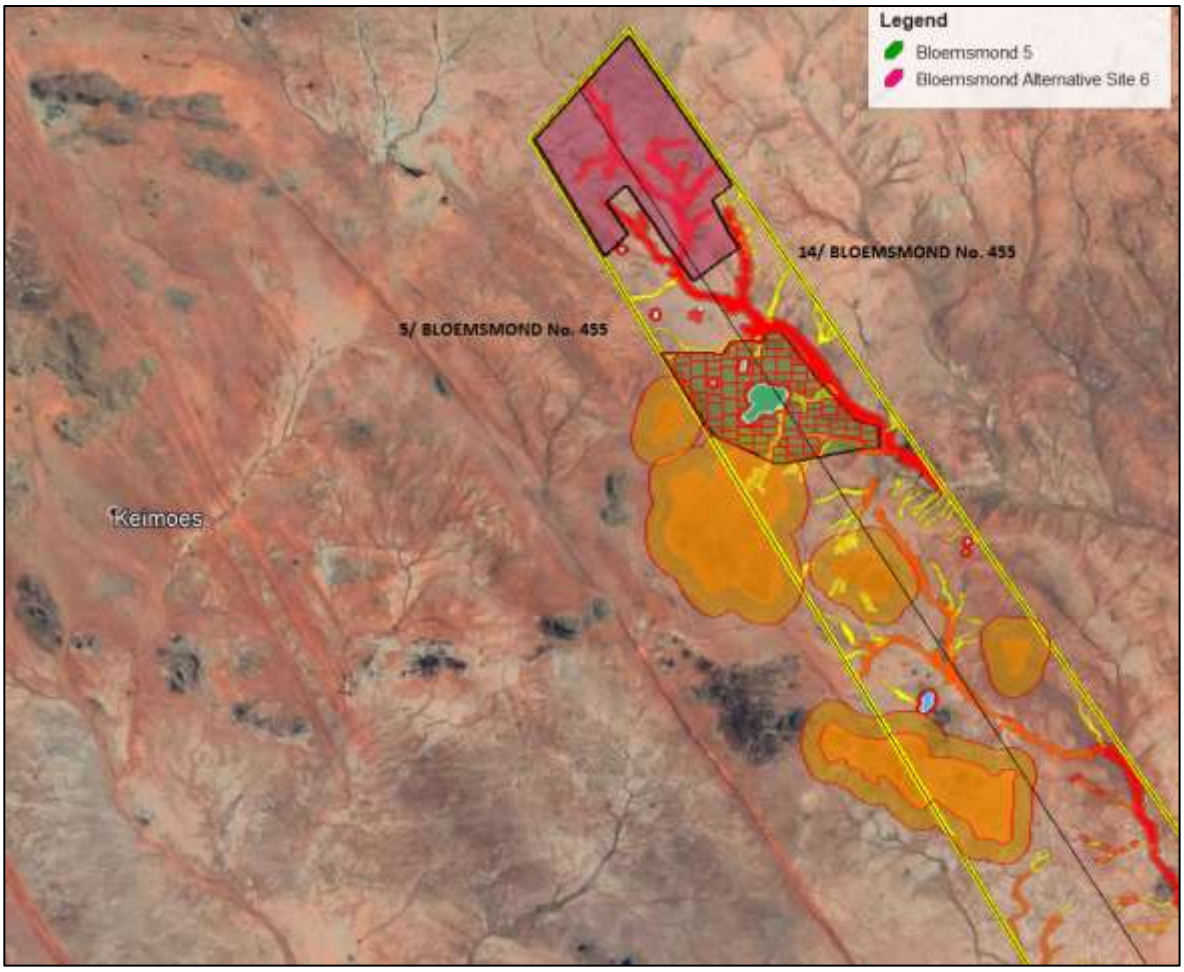

Figure 5: Layout Alternative 2

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 Bloemsmond 5 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;
- Office;
- 2 x Warehouses;
- Canteen & Visitors Centre;
- Staff Lockers & Ablution; and
- Gate house / security offices.

The total area occupied is approximately 1 ha, excluding the facility switching station/ substation.

3.4 WASTE MANAGEMENT

3.4.1 Solid waste

Solid waste during the construction phase will mainly be in the form of construction material, excavated substrate and domestic solid waste. All waste will be disposed of in scavenger proof bins and temporarily placed in a central location for removal by the contractor. Any other waste and excess material will be removed once construction is complete and disposed of at a registered waste facility.

3.4.2 Sewerage

During the construction phase, chemical ablution facilities will be utilised. These ablution facilities will be maintained, serviced and emptied by an appointed contractor, who will dispose of the effluent at a licensed facility off site. Once construction is complete, the chemical ablution facilities will be removed from the study area. A conservancy tank which will be regularly emptied by a registered service provider will be installed at the Operations & Maintenance building.

3.4.3 Hazardous substances

During the construction phase, use of the following hazardous substances is anticipated:

- Cement powder associated with the batching plant;
- Petrol/diesel for trucks/ cranes/ bulldozers; and
- Limited amounts of lubricants and transformer oils.

Temporary storage and disposal of hazardous waste will be done in compliance with relevant legislation (i.e. stored in covered

3.5 GRID CONNECTION AND CABLING

It is proposed to connect the SEF directly to the planned the Upington MTS located ± 10.5km to the east of the Bloemsmond 3 site see Figure 9. The SEF substation will be approximately 150m x 150m in size and feature a step-up transformer/s to transmit electricity via a 132 kV OHL directly to the Upington MTS. The OHL is envisaged to be ± 13km in length, 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 ± 60 centralised inverters, or a maximum of ± 840 string inverters), each of which is connected to the on-site / facility substation.

Final placement of the inverter stations and on-site/facility 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.

3.6 ACCESS ROUTES AND INTERNAL ROADS

The proposed project site is accessible via the major national road found in the broader study area, the N14, which connects Upington and Keimoes in a south-west direction.

- Preferred Access Road 1 (orange route in Figure 10) is the most technically and environmentally preferred access road. This route of ~7km in length connects the site via the N14 national road and runs along the eastern boundary of portion 14 of the farm Bloemsmond 455. The proposed access road utilizes a large section of an existing farm track which will reduce the environmental impact.
- Alternative Site Access (red & yellow) follows an existing farm access road; the red section has been authorised under the Bloemsmond 1 and 2 Environmental Authorisations. The route traverses the farm Bloemsmond West RE/623, the route will pass along the western side of the smaller vineyards that are located on Farm Bloemsmond-Wes RE/623. The access road will run northwards adjacent to Bloemsmond 1 and continue northwards for approximately 4km bypassing Bloemsmond 4 to the east to gain access to Bloemsmond 5.
- There is a link road which connects alternative 1 (east) & 2 (west) entrances off the N14 to one another.

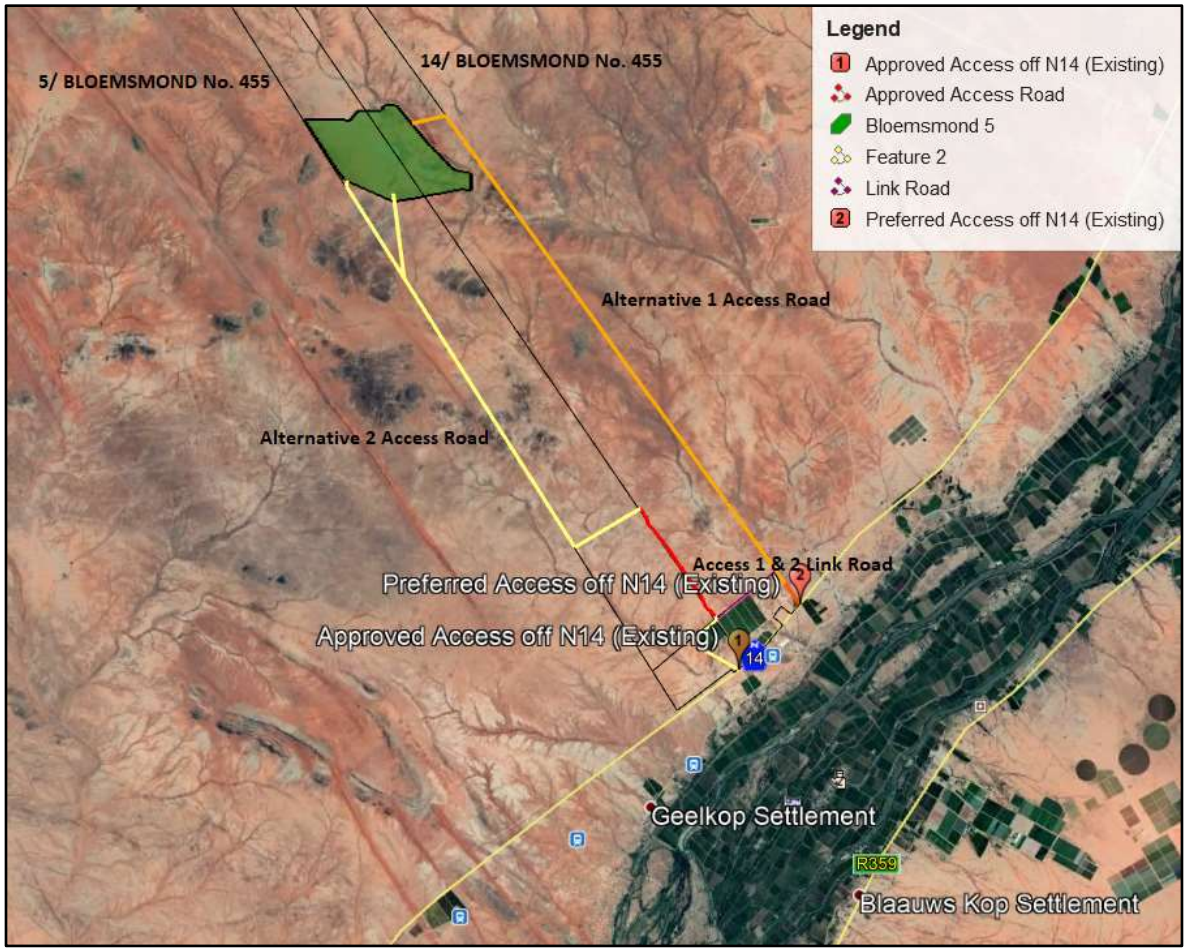

Figure 9: Access Routes to Bloemsmond 5

The internal road network of the SEF will be gravelled roads, 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.

A detailed transport and traffic plan is currently being compiled for the project and will assessed in the impacts tables of the BAR. 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.

4. CONCLUSION

Layout Alternative 1 (Preferred) has been developed based on key criteria identified above, including inter alia, already authorised solar footprints, accessibility, assessment of alternatives, proximity to the Upington MTS, as well as consideration of sensitive areas to minimise ecological and other impacts.

Further assessment will be undertaken for the proposed Layout Alternative 1 site during the detailed EIA phase of the project.

5. LIST OF REFERENCES

PV Magazine (January 2018). *South Africa: Outstanding PPAs for solar, renewables to be signed by end of March.* Retrieved from: https://www.pv-magazine.com/2018/01/19/south-africa-outstanding-ppas-for-solar-and-renewables-to-be-signed-by-the-end-of-march/

Sempra Renewables. (23 June 2014) Boulder City, NV – Copper Mountain Solar 1 Retrieved from: *https://www.glassdoor.com/Photos/Sempra-Renewables-Office-Photos-IMG213060.htm*

Solar Power Plant Business. (07 December 2013). *Abandoned Farmland Serves as Solar Site*. Retrieved from: *http://techon.nikkeibp.co.jp/english/NEWS_EN/20131207/321200/?ST=msbe*

SolarPro. (June/July 2010). *Ground-Mounted PV: Page 6 of 9*. Retrieved from *http://solarprofessional.com/articles/design-installation/ground-mounted- pv/page/0/5*

The Million Solar Roof Initiative – Solar Salvation or Solar Scam? California PV Solar Farms – A Bitter Harvest! (2014, January). Retrieved from GO Solar CALIFORNIA: http://www.gosolarcaliforniainformation.com/