HILLARDIA PV

TECHNICAL LAYOUT DEVELOPMENT REPORT FOR HILLARDIA PV

(PV Magazine, 2018)

Prepared for:

Cape Environmental Assessment Practitioners (Pty) Ltd

Date: 07 March 2022

Contact Person:

Amy Hill

Hillardia PV (Pty) Ltd
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: amy@atlanticep.com

CONFIDENTIAL

DOCUMENT HISTORY

REVISION HISTORY

Revision No	Revision Date	Author
Draft	25 February 2022	Amy Hill
Final		
Revision 1		
Revision 2		

APPROVAL FOR RELEASE

Name	Title	Signed
Anthony De Graaf	Director	

DISTRIBUTION

Name	Designation	Company
Dale Holder	EAP	Cape EAPrac
Anthony De Graaf	Director	Hillardia PV (Pty) Ltd

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

The Applicant, Hillardia PV (Pty) Ltd, is proposing the construction of a photovoltaic (PV) solar energy facility (known as the Hillardia PV facility) located on a site approximately 10 km north west of the town of Lichtenburg in the North West Province. The solar PV facility will comprise several arrays of PV panels and associated infrastructure and will have a contracted capacity of up to 100 MW.

The development area is situated within the Ditsobotla Local Municipality within the Ngaka Modiri Molema District Municipality and is accessible via the R505, located east of the development area.

The development area for the PV facility and associated infrastructure will be located on the following properties:

- Portion 2 of the Farm Houthaalboomen 31
- Portion 3 of the Farm Houthaalboomen 31
- Portion 4 of the Farm Houthaalboomen 31

An assessment area of approximately 230 ha is being assessed as part of this EIA process and the infrastructure associated with the 100 MW facility includes:

- PV modules and mounting structures;
- Inverters and transformers;
- Battery Energy Storage System (BESS);
- Site and internal access roads (up to 8m wide);
- Auxiliary buildings (22kV or 33kV switch room, gate-house and security, control centre, office, warehouse, canteen & visitors centre, staff lockers etc.);
- Temporary and permanent laydown area;
- Cabling between the panels, to be laid underground where practical; and
- Grid connection infrastructure, including:
  - Underground medium-voltage cabling between the project components and the facility substation (within a 100 m wide and 2.5 km in length corridor); and
  - Up to 132kV facility substation

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

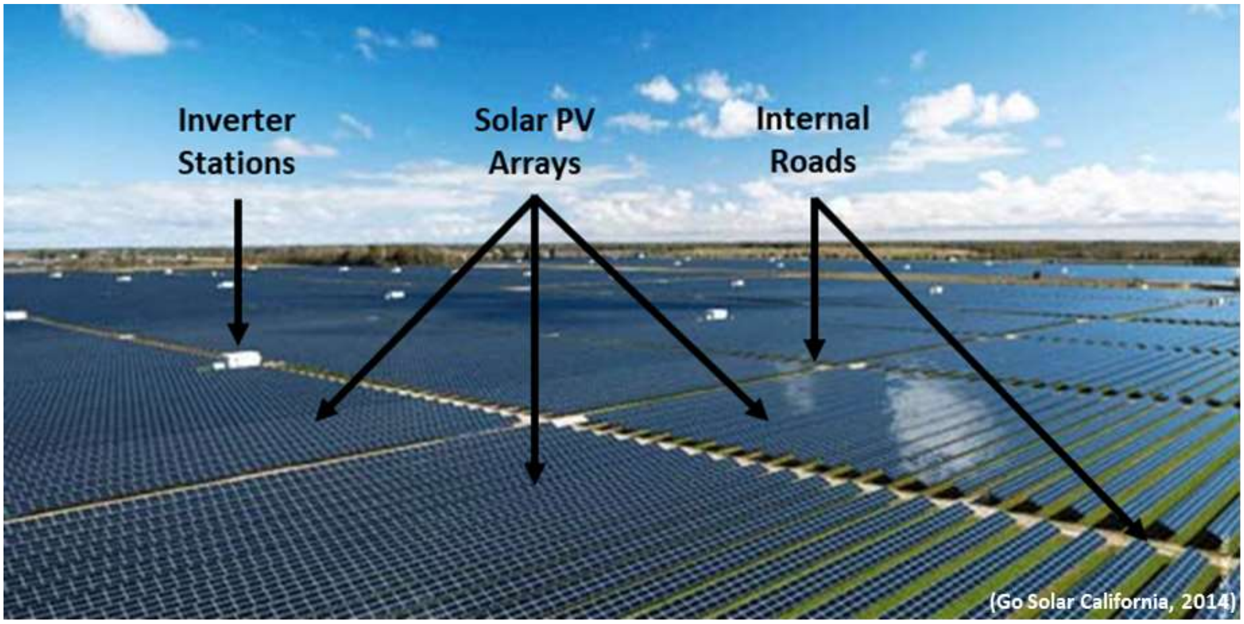

Figure 1: Typical Layout of a Solar PV Energy Facility

Hillardia PV will have a net generating capacity of 100 MW with an estimated maximum footprint of ± 230 ha. The approximate area that each component of Hillardia PV will occupy is summarised in Table 1 below.

Table 1:Component Areas and % of Total Project Area

SEF Component	Estimated Area	% of Total Area (± 230 ha)	% of Study Area (602 ha)
PV array	± 181 ha	78,70%	30,07%
Permanent and construction laydown	Up to 5 ha	2,17%	0,83%
Auxiliary buildings	± 1 ha	2,17%	0,83%
Internal roads	± 8 ha	3,48%	1,33%
Substation	± 1 ha	0,43%	0,17%
MV cabling corridor	+- 25 ha	10,87%	4,15%
Main Road	Approx. 5 ha	0,43%	0,17%
BESS	Up to 4 ha	1,74%	0,66%

2. PROJECT ALTERNATIVES

2.1 LOCATION ALTERNATIVES

The site selection process for a PV facility is almost always underpinned by a good solar resource. Other key considerations include environmental and social constraints, proximity to various planning units and strategic areas, terrain and availability of grid connection infrastructure.

Based on the above site-specific attributes discussed in more detail in the Site Selection Motivation report, the study area is considered to be highly preferred in terms of the development of a solar PV facility. As such, no property / location alternatives will be considered.

2.2 SITE LAYOUT ALTERNATIVES

2.2.1 PV Facility

It is customary to develop the final/detailed construction layout of the solar PV facility only once an Independent Power Producer (IPP) is awarded a successful bid under the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) or an alternative programme, after which major contracts are negotiated and final equipment suppliers identified.

For the purpose of the Environmental Impact Assessment (EIA), site layout alternatives will not be comparatively assessed, but rather a single layout will be refined as additional information becomes available throughout the EIA process (e.g. specialist input, additional site surveys, ongoing stakeholder engagement).

The development area presented in the Scoping Report has been selected as a practicable option for the facility, considering technical preference and constraints, as well as initial No-Go layers informed by specialist site surveys.

Following further site screening by the avifaunal and biodiversity specialist (scheduled to take place during the EIA phase), the development footprint[1] will be finalised for impact assessment.

---

[1] The development footprint is the defined area (located within the development area) where the PV panel array and other associated infrastructure for Hillardia PV facility is planned to be constructed. This is the actual footprint of the facility, and the area which would be disturbed.

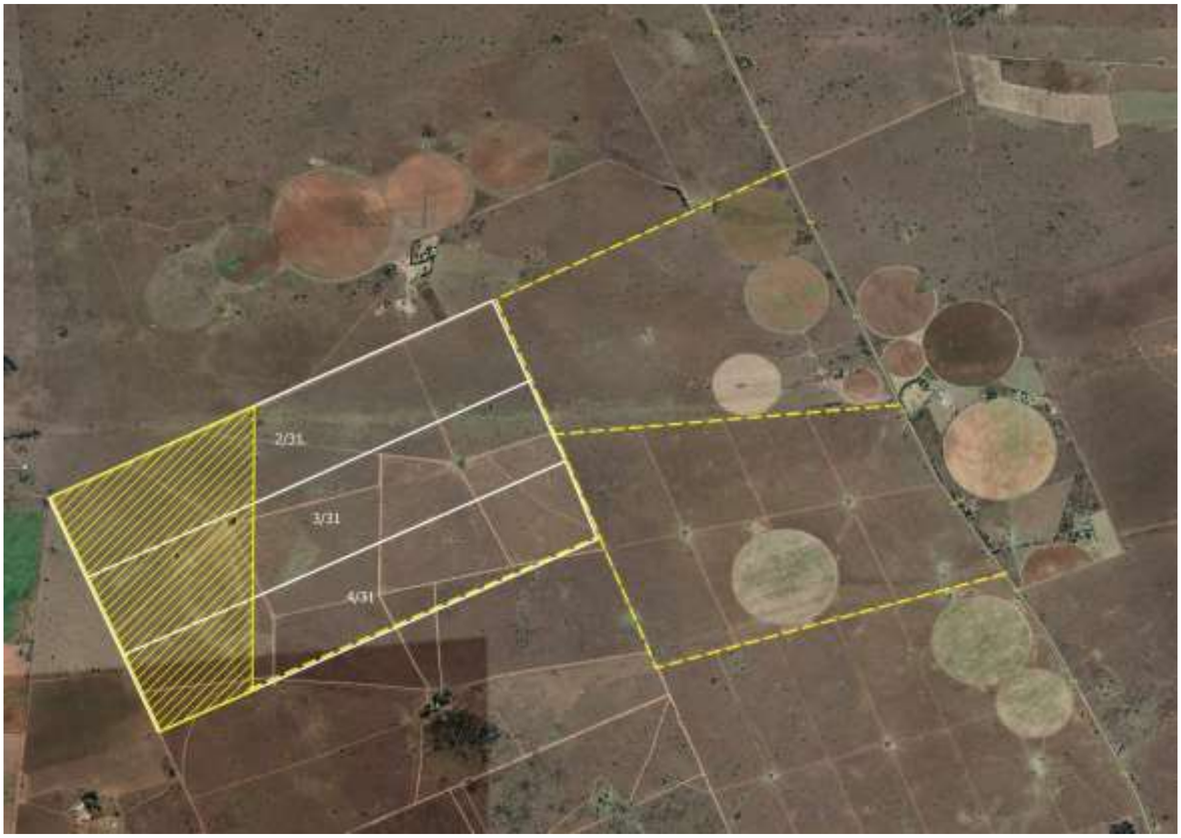

Figure 2: Hillardia PV Assessment Area (white) & Development Area (yellow)

2.2.2 Access Route Alternatives

The site will be accessible via the regional road R505 located to the east of the project site.

Three access road route options have been identified based on existing access to the project site and landowner support. A traffic specialist has been appointed to facilitate and guide the identification of technically feasible options which will be based on, amongst others, feasible access points and oversized vehicle / abnormal load constraints.

Figure 3: Hillardia PV Access Route Alternatives

3. OVERVIEW OF THE SOLAR ENERGY FACILITY

The following section presents an overview of the main components of Hillardia PV.

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 4), driven/ rammed piles (Figure 5), or ground/ earth screws mounting systems (Figure 8).

Figure 4: Cast Concrete Foundation

(Solar Power Plant Business, 2013)

Figure 5: Driven/ Rammed Steel Pile

(SolarPro, 2010)

Figure 6: 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. Hillardia PV will therefore aim to make the most use of pre drilling and backfilling of holes prior to 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 the following as a minimum:

1. 33 kV switch room;
2. Control building/ centre;
3. Offices;
4. Warehouses;
5. Canteen & visitors centre;
6. Staff lockers & ablution; and
7. Gate-house and security.

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

3.4 GRID CONNECTION AND CABLING

The Hillardia PV grid connection infrastructure includes:

- Underground medium-voltage cabling between the project components and the facility substation (within a 100 m wide and 1.5 km in length corridor); and
- Up to 132kV facility substation.

The Hillardia PV facility substation (as well as the Hillardia PV and Euphorbia PV facility substations) will be located directly adjacent to the Houthaalboomen North collector switching station in the south-eastern corner of Portion 4 of the Farm Houthaalboomen 31.

The Houthaalboomen North collector substation/ switching station will facilitate the connection of the cluster facility substations to the Watershed Main Transmission Substation (MTS) via a single or double circuit 132 kV overhead powerline.

The connection infrastructure between the collector switching station and the MTS will be assessed as part of a separate Environmental Application.

3.5 BATTERY STORAGE

Renewable energy can currently achieve lower costs than fossil fuels. By incorporating energy storage technologies into renewable energy facilities, electricity can be stored during generation peaks and supplied during demand peaks.

Lower costs coupled with improved efficiencies, high energy density, lightweight design and low environmental risks, make non-liquid/ solid-state (e.g. Lithium battery technologies) the preferred alternative (refer to standalone Battery Storage Technical Development Report).

Hillardia PV BESS will cover a maximum area of approximately 4 ha.

3.6 ACCESS ROUTES AND INTERNAL ROADS

Existing access to the affected properties is via farm roads off the R503. For various reasons, the applicant considers this technically not feasible and is proposing access via the R505.

Three access road alternatives (ranging from ~2 – 4 km in length) have been identified and will be considered / screened during the scoping phase. A traffic specialist has been appointed to facilitate and guide the identification of technically feasible options which will be based on, amongst others, feasible access points and oversized vehicle / abnormal load constraints.

The majority of the access road will follow existing, gravel farm roads that may require widening up to 10 m (inclusive of storm water infrastructure). Where new sections of road need to be constructed (/lengthened), this will be gravel/hard surfaced access road and only tarred if necessary.

A network of gravel internal access roads and a perimeter road, each with a width of up to ± 5 m, will be constructed to provide access to the various components of the Hillardia PV development.

A detailed transport and traffic study is currently being compiled for the project and will be assessed in the impacts tables of the EIA Report. 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.

3.7 SERVICES REQUIRED

3.7.1 Waste Management

3.7.1.1 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. Excess excavation material will either be spoiled offsite at a registered facility or used for landscaping berms within the overall PV footprint.

3.7.1.2 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 and on-site/ facility substation and the BESS control room.

3.7.2 Hazardous substances

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

1. Cement associated with piling activities and construction of buildings and inverter station plinths;
2. Petrol/ diesel for construction plant; and
3. 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 containers with appropriate bunding). Refuelling areas to be in designated positions, with suitable mitigation to reduce the risk of hydrocarbon spills.

3.7.3 Water Supply

Water required during the construction and operation phases will be sourced from (in order of priority):

1. The Local Municipality (LM) - Specific arrangements will be agreed with the Ditsobotla Local Municipality in a Service Level Agreement (SLA). Most likely the water will be either trucked in, or otherwise made available for collection at their Water Treatment Plant via a metered standpipe.
2. Investigation into a third-party water supplier which may include a private services company.
3. The investigation of drilling a borehole on site, which includes complete geohydrological testing, groundwater census and a Water Use License Application (WULA) in terms of section 21a of the National Water Act, 1998.

4. CONCLUSION

The layout proposed at scoping phase has been developed based on key criteria identified above, including inter alia, accessibility, proximity to the Watershed MTS, as well as consideration of sensitive areas to minimise ecological and other impacts.

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/