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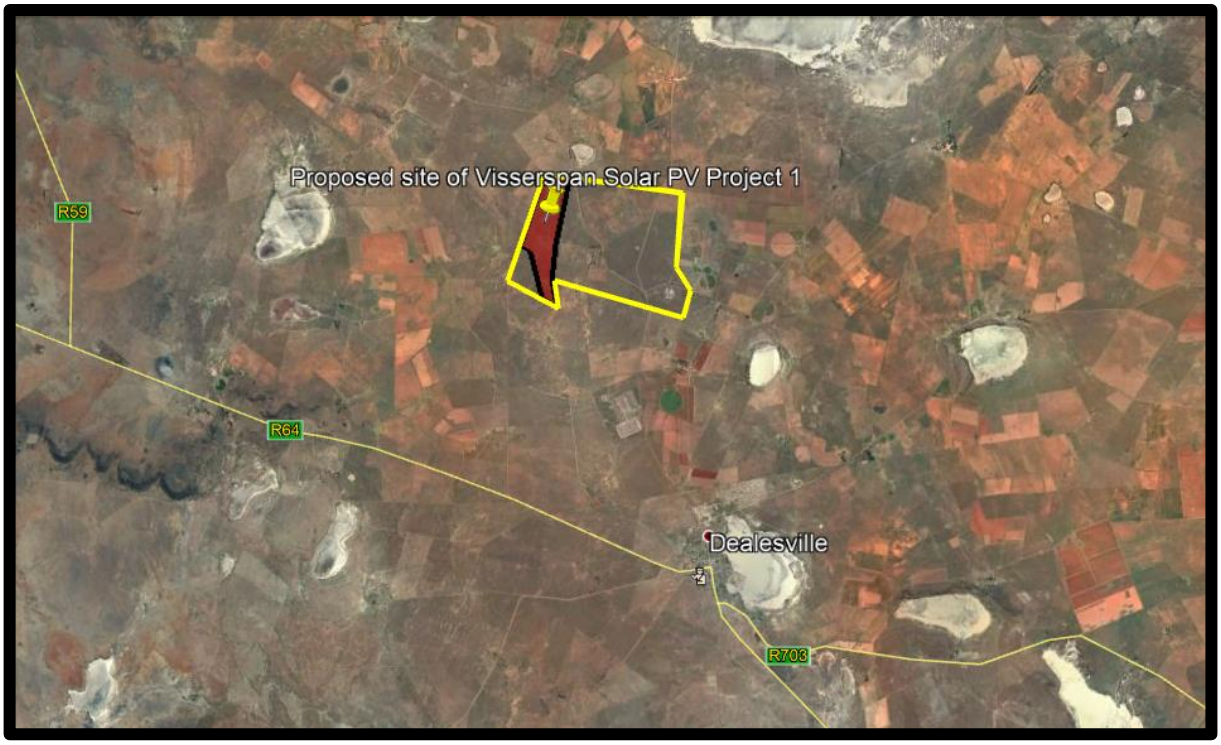
VENTURA RENEWABLE ENERGY (PTY) LTD

PROPOSED VISSERSPAN SOLAR PV FACILITY - PROJECT 1

on Visserspan Farm No. 40, near Dealesville,
Tokologo Local Municipality, Free State Province



FINAL BASIC ASSESSMENT REPORT

in terms of the National Environmental Management Act, No. 107 of 1998 (as amended)
and associated environmental impact assessment regulations, 2014

Ref. No: 14/12/16/3/3/1/2153

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EXECUTIVE SUMMARY

EnviroAfrica CC has been appointed by Ventura Renewable Energy (Pty) Ltd, to undertake the environmental impact assessment (EIA) application process for the development of a solar photovoltaic (PV) array on the Farm Visserspan No. 40, approximately 10km northwest of Dealesville and 68km northwest of Bloemfontein, in the Free State Province.

As part of the application for an environmental authorisation (EA), a basic assessment report (BAR) is required since, although the proposed development is for a large scale solar PV facility capable of generating of more than 20MW but less than 100MW of electricity, which would have normally required a scoping and full environmental impact report, the proposed development falls within renewable energy development zone 5 (REDZ 5) and therefore, GN. 350 of 2017 applies. Accompanying this basic assessment report (BAR) is Ventura Renewable Energy (Pty) Ltd's (Ventura's) application for environmental authorisation.

It is proposed that the development footprint for Visserspan Solar PV Facility - Project 1, cover an area of around 218ha, circumscribed with a perimeter fire access road and fence. The PV tables will face north and will be raised approximately 500mm above ground level at their lower level and will not exceed a height of 3m when at full tilt (upper level). The PV tables will have single axis tracking systems allowing the evacuated generation of not more than 100MW of alternating current.

The infrastructure associated with the proposed solar PV array includes a fenced construction staging/laydown area (a portion of which will form the operational laydown area), maintenance shed/s, inverter-transformer stations on concrete pads, 6 x12m battery storage banks/containers adjacent to the inverter-transformer stations and office buildings with ablutions, all within the 218ha proposed development site footprint. There will also be sub-surface powerlines leading from the PV facility to a proposed future sub-station located on the Visserspan property. From the substation, connection or tie-in to the national power grid will take place via overhead powerlines, at Eskom's Perseus substation, south of the proposed development site. It should be noted that the proposed future substation and overhead powerlines do not form part of this application.

The National Environmental Management Act, No.107 of 1998 (NEMA), as amended, makes provision for the identification and assessment of activities that are potentially

detrimental to the environment and which require authorisation from the competent authority based on the findings of an Environmental Assessment.

NEMA as a national act, is enforced by the national Department of Environment, Forestry and Fisheries (DEFF). Typically, these powers are delegated to the provincial department of environmental affairs but since the legislated (or listed) activity which results from the proposed development, occurs in an area of strategic importance identified in terms of Section 24(3) of NEMA, namely in a Renewable Energy Development Zone (REDZ) and associated strategic transmission corridor, DEFF is the competent authority for this environmental authorisation application.

According to the regulations of Section 24(5) of the NEMA, environmental authorisation is required for certain regulated or listed activities. The schedules of listed activities under the NEMA were evaluated to determine which actual and possible activities required authorisation. Several actual and potential listed activities, as per the 2014 EIA regulations (as amended), apply to the proposed Visserspan Solar PV Facility development. These activities are detailed in Section 6 of this basic assessment report (BAR).

It should be noted that due to the consent use of land (as per Appendix K) and the proximity to Eskom's Perseus substation, as well as the other renewable energy developments/proposed developments, alternative sites do not exist. However, alternative options which include *inter alia* alternative PV technology, layout options and the option of not proceeding with the proposed development at all (the No-Go option) are considered within this BAR. Specialist reports (final versions) are referenced and appended to this BAR.

The findings, results, observations and recommendations given in this assessment are based on the best scientific and professional knowledge available from information provided and verified by site visits.

A brief synopsis of the main opinion of each of the seven specialists appointed to assess various parameters of the project is presented below:

Botanical / Biodiversity:

The dominant vegetation type found on Visserspan Farm No. 40 is Vaal-Vet Sandy Grassland, an endangered (A1) vegetation type (Government Gazette, 2011). The proposed development would result in a high local loss of this vegetation type (habitat) and loss of ecological functionality. Mitigation options are minimal to zero and the impact at a local scale is thus **High Negative.** However, since the Vaal-Vet Sandy Grassland is an extensive system and not confined to Visserspan, the cumulative impact would be **Low Negative** and loss of resources would be low, particularly when considering the grazing and other pressures the land is subject to. Consequently, the development of the Solar PV Project 1 at Visserspan is supported from a botanical (vegetation) perspective.

It should be noted that a small variation in vegetation type occurs in the southwest corner of Visserspan Farm No. 40, where trees of *Vachellia karoo* are present. At the outset, this area was identified as a 'No Go' area and was thus avoided when selecting the Solar PV Project 1 area.

Owing to the widespread occurrence of the principal vegetation type, Vaal-Vet Sandy Grassland, the botanical specialist holds the view that Vaal-Vet Sandy Grassland is not sensitive at Visserspan. The classification of areas as critical biodiversity areas (CBAs) and ecological support areas (ESAs) on the farm was also questioned and it was stated that the ESAs and degraded areas are incorrectly mapped.

Freshwater:

There are no watercourses on or within 32m of the proposed development site for Visserspan Solar PV Facility – Project 1. This was confirmed by the freshwater specialist study which was undertaken for the entire Visserspan Farm No. 40 as per Appendix G2.

As for the botanical aspects, areas of importance due to the presence of watercourse (pans) on other areas of the farm, were also identified as no-go areas (with a 32m setback).

Heritage:

Archaeological:

According to the specialist archaeological impact assessment (as per Appendix G3a), no archaeological resources were recorded in the proposed development footprint area for Visserspan Solar PV Facility – Project 1.

In terms of the total Visserspan Farm property, the archaeological impact assessment further states that, “archaeological resources have been rated as having LOW (Grade IVC) significance since, generally, relatively small numbers of archaeological remains were found in other areas of the farm (not part of Project 1’s site) and were isolated and were found in a disturbed context.

No evidence of any Late Iron Age archaeological heritage was noted during the field assessment, which appears to be absent from the study area.

No evidence of any Anglo-Boer War battlefield sites (1899-1904), war graves or memorials were encountered during the study”.

No mitigation of archaeological resources is required prior to construction activities commencing.

However, historic (c. 1899), calcrete and clay, sheep and cattle enclosures within the farm werf must not be disturbed, damaged or altered in any way by activities. The structures are protected under Section 34 of the National Heritage Resources Act (No. 29 of 1999) and cannot be disturbed in any way without a permit issued by SAHRA. These structures have been left out of the proposed development footprint and are considered a no-go heritage area.

Palaeontological:
According to the specialist palaeontological impact assessment report attached as Appendix G3b, it was “concluded that the palaeontological sensitivity of the solar PV project area on Farm Visserspan No. 40 near Dealesville is low. Anticipated impacts on local palaeontological heritage resources from the construction phase of the developments are accordingly also of LOW SIGNIFICANCE.

This applies equally to all four of the proposed solar PV facilities whose cumulative impact significance would also be LOW.

No further significant impacts are expected during the operational and decommissioning phases of the developments.

There are no fatal flaws in the development proposals".

The SAHRA Archaeology, Palaeontology and Meteorites (APM) Unit has reviewed the heritage related specialist studies appended to this final BAR and states that since no heritage resources will be impacted by Visserspan Solar PV Facility – Project 1, and the sensitivity of palaeontological resources is considered low, SAHRA APM has no objections against the proposed development subject to the specialists' recommendations and the conditions as outlined in the SAHRA's final comment (as per Appendix E6).

Visual:

An assessment of the potential visual receptors through the use of landscape profiles coupled with on-site verification was undertaken.

The term visual and aesthetic is defined to cover the broad range of visual, scenic, cultural, and spiritual aspects of the landscape. It also includes the impact on 'sense of place' of the area.

The visual receptors in the area are of medium to low sensitivity. The assessment finds that the overall visual impact of the proposed Project 1 of the Visserspan PV facility holds a low overall visual impact. For this reason, no mitigation measures are required.

Sarien Lategan was appointed to undertake the visual impact assessment for the Visserspan PV Facility, Project 1, near Dealesville, Free State.

Due to the fact that a number of PV facilities have been approved to the south of Project 1, the project does contribute to the cumulative impact specifically to spatial crowding. The pro rate contribution to the overall number of approved projects is however low. Since no thresholds have been determined on a regional level it is not appropriate to assess the impact on landscape change.

Soil, Land Use and Agricultural Potential Impact Assessment:

Due to the soil properties, land use for the type of land found on the proposed development site, is extensive grazing. This is also due to climatic constraints.

According to the specialist, *"land capability mimics the land use" and "the agricultural potential in terms of dryland cropping is low due to lower than 500 mm rainfall per annum, with grazing potential being dependent on rainfall and management"*.

It was concluded by the specialist that *"the proposed development of a photovoltaic facility on the site will not have large impacts due to the low agricultural potential of the site as well as the rainfall that is below 500 mm pa.*

Socio-economic:

The specialist has indicated "*no strong opinion, from a socio-economic point of view, as to whether the Visserspan solar PV projects should be permitted, either singly or together*" but notes positive and negative factors regarding the Visserspan Solar PV Project.

CONTENTS

1. ACRONYMS

BAR	Basic Assessment Report
BGIS	National Biodiversity Geographic Information System
CAA	Civil Aviation Act, No. 13 of 2009
CBA	Critical Biodiversity Area
DBAR	Draft Basic Assessment Report
DEA	Department of Environmental Affairs
DEA&DP	Western Cape Department of Environmental Affairs and Development Planning
DoH	Department of Health
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
ECA	Environment Conservation Act, No. 73 of 1989
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMF	Electromagnetic Field
EMPr	Environmental Management Programme
ESA	Ecological Support Area
HIA	Heritage Impact Assessment
HWC	Heritage Western Cape
ICASA	Independent Communications Authority of South Africa
ICASAA	Independent Communications Authority of South Africa Act, No. 13 of 2000 (and regulations as amended by the Broadcasting Amendment Act, No. 64 of 2002)
ICT	Information and Communications Technology
I&APs	Interested and Affected Parties
MNO	Mobile Network Operators
NEMA	National Environmental Management Act, No. 107 of 1998 (and as amended)
NEM:AQA	National Environmental Management: Air Quality Act, No. 39 of 2004 (and as amended)
NEM:BA	National Environmental Management: Biodiversity Act, No. 10 of 2004 (and as amended)

NEM: PAA	National Environmental Management: Protected Areas Act, No. 57 of 2003 (and as amended)
NEM:PAAA	National Environmental Management: Protected Areas Amendment Act, No. 15 of 2009
NEM:WA	National Environmental Management: Waste Act, No. 59 of 2008 (and as amended)
NHRA	National Heritage Resources Act, No. 25 of 1999 (and as amended)
NRA	National Roads Act, No. 7 of 1998
NWA	National Water Act, No. 36 of 1998 (and as amended)
SACAA	South African Civil Aviation Authority
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANRAL	South African National Road Agency (Pty) Ltd
SANRAL	The South African National Roads Agency Limited
SIP	Strategic Integrated Project
WHO	World Health Organisation
WULA	Water Use Licence Application

2. TERMS OF REFERENCE

EnviroAfrica CC is an independent environmental consulting firm that has no interest in the proposed activity other than fair remuneration for services rendered. Remuneration for services is not linked to approval by decision making authorities and EnviroAfrica has no vested interest in secondary or subsequent development which may result from this project. There are no circumstances that compromise the objectivity of this environmental impact assessment.

The Applicant, Ventura Renewable Energy (Pty) Ltd, appointed EnviroAfrica CC on 21 October 2019 to facilitate the environmental impact assessment and authorisation application/s associated with the proposed development.

It should be noted that Ventura Renewable Energy (Pty) Ltd (Company registration number: 2019/545107/07), as the holding company of the Visserspan projects, intends to develop four separate solar PV facilities on the Farm Visserspan No. 40. Each facility will generate between 75MW and approximately 100MW. Environmental authorisation applications will be made for each proposed facility separately.

Each facility will be bid in the next Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) bidding process using the special purpose vehicle (SPV), Keren Energy Visserspan No. 1, 2, 3 or 4 but it is not certain which of the four, or if all four proposed facilities, will actually be successful and consequently, constructed.

The SPV for Visserspan Solar PV Facility – Project 1, is Keren Energy Visserspan No. 1 (Pty) Ltd.

The findings, results, observations and recommendations given here are based on the best scientific and professional knowledge available from information provided by the Applicant and independent specialists. Where required, information has been verified by site visits.

EnviroAfrica reserves the right to modify aspects of this report, including the recommendations, if new information becomes available which may have a significant impact on the findings of this report.

This report was compiled by Vivienne Thomson on behalf of EnviroAfrica CC.

3. EAP QUALIFICATIONS

Vivienne Thomson: Vivienne holds a BSc in Zoology from the University of Cape Town (1995) and has over twenty years industry experience in the construction, power generation and mining sectors. She has completed an ISO 14001 Lead Auditors course, as well as several environmental short courses and has guest lectured for the MSc in Environmental Science Environmental Impact Assessment (EIA) course at the University of the Witwatersrand.

Vivienne is a member of the National Association for Clean Air (NACA) and has served as NACA National Council Member. She is a previous member of the South African Coal Ash Association and an affiliate of the Institute of Innovators and Inventors. She was also a member of the Committee of Interested Parties which acted as an independent, advisory body to ensure impartiality of Pricewaterhouse Coopers' Certification Body in their governance and sustainability division.

Since 2004, Vivienne has been involved in environmental consulting with experience in EIAs, establishing and implementing ISO 14001 EMSs, contract management, legal compliance evaluations, as well as developing, implementing and assessing environmental management plans and monitoring programmes.

Qualifications Summary: BSc, Zoology (UCT); EIA short course (PU), Environmental Law (PU), Advanced Environmental Law (Mandela Institute School of Law, Wits), ISO 14001 Lead Auditors Course (WTH Management and Training), Root Cause Analysis Technique (IRCA), Environmental Performance Measurement Workshop (African Centre for Energy and Environment), Basic Principles of Ecological Rehabilitation and Mine Closure (PU), Member: National Association for Clean Air

EnviroAfrica CC Owner: Bernard de Witt

Bernard de Witt Qualifications Summary: BSc, Forestry (SU); BA (Hons), Public Administration (Stellenbosch); National Diploma in Parks and Recreation Management; EIA Short course (UCT); ISO 14001 Auditors course (SABS); IAIA (SA) Membership Number: 219

Please refer to Appendix M (EAP Declaration and *Curriculum Vitae*)

4. INTRODUCTION

4.1.1. Project Rationale

In March 2011, the Department of Energy's (DoE's) Integrated Resource Plan (IRP) 2010-2030 was promulgated with the aim of providing a long-term, cost-effective strategy to meet the electricity demand in South Africa. The IRP 2010-2030 objectives align with Government's in terms of reliable electricity supply, as well as environmental and social responsibilities and economic policies. The study horizon for the IRP was the period from 2010 to 2030.

The short to medium term intentions of the IRP 2010 -2030 are to ascertain the most cost-effective electricity supply option for the country, speak to the opportunities for investment into new power generation projects and determine security of electricity supply.

The IRP's long-term electricity planning goal is to consider social, technical, environmental and economic constraints, as well as other externalities while ensuring sustainable development in the country.

To this end, within the IRP, the DoE set a target electricity supply of 17.8 GW from renewable energy sources by 2030. This target renewable energy capacity would be produced primarily by solar, wind, biomass and small-scale hydro electricity generation (with the bulk being met by wind and solar energy supplies). In addition, the 2030 target ensures that approximately 42% of the country's total estimated electricity generation capacity would be met by renewable energy sources. This application is in response to the DoE's target and IRP 2010-2030 strategy to expand the South African renewable energy electricity generation capacity.

Activity Overview

The project is the establishment of an array of crystalline solar photovoltaic (PV) modules grouped into tables or panels of 20 modules each, together with associated infrastructure for the generation of between 75MW to approximately 100MW of electricity. The PV tables for Visserspan Solar PV Facility - Project 1 would form an array covering an area of not more than 218ha, surrounded by a perimeter fire access road and fence. This development footprint does not include evacuation powerlines and substation/s external to the 218ha site which will be dealt with in a separate environmental authorisation application.

The PV tables will be raised approximately 500mm above ground level and have single axis tracking systems allowing maximisation of solar energy harvesting for conversion to electrical energy. Similar solar PV arrays are depicted in Figure 1 below.


Figure 1: Single axis solar PV module tables raised 500mm above ground level (to a maximum tilt height of 3m).

Proposed associated infrastructure includes a fenced construction staging/lay-down area (a portion of which will form the operational lay-down area), inverter-transformer stations on concrete pads, 6 x12m battery storage banks/containers adjacent to the inverter-transformer stations, office buildings with ablutions, maintenance shed/s and a switch panel for connection to the power grid, all within the 218ha site. It is proposed that the powerlines within the facility, as well as the approximately 22kV powerline/s used for evacuation of electricity from the solar PV facility to a proposed future substation on the Visserspan property, be underground/sub-surface. From the proposed future substation tie-in to the national grid will occur via overhead powerlines. Eskom's Perseus substation is located about 7km south-east of the proposed development site, as the crow flies but the length of the above ground evacuation/tie-in power line (following the predetermined routes as negotiated with Eskom and landowners) must still be finalised. It must be noted that the proposed future substation and overhead powerline connection to the national grid does not form part of this application.

Figure 2 below indicates the position of the proposed Visserspan Solar PV Facility - Project 1, relative to other proposed solar PV arrays on the Farm Visserspan (cumulative depiction should all the Visserspan Project be authorised and developed), as well as array relative to Eskom's existing high voltage power lines and Perseus substation.

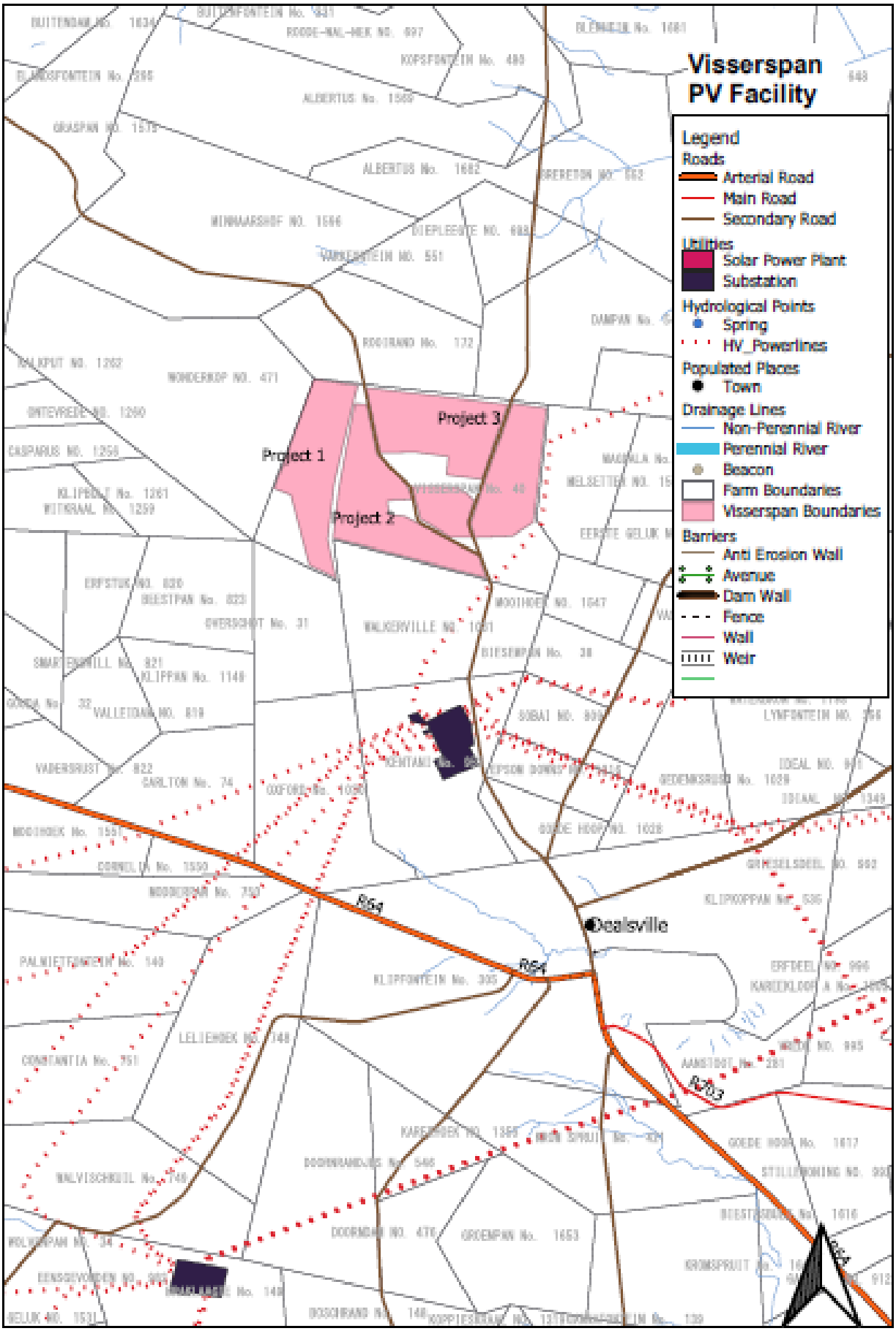

Figure 2: Indication of the proposed Visserspan Solar PV Facility - Project 1's position, relative to other proposed solar PV arrays on the Farm Visserspan (cumulative depiction should all the Visserspan Projects be authorised and developed), as well as relative to Eskom's existing high voltage power lines and Perseus substation (closest substation to Visserspan Farm No. 40).

Refer to Appendix A for detailed site-specific layout, sensitivity overlay, status quo and regional maps.

4.1.2. Need and Desirability

The proposed development is in line with the national DoE's IRP 2010-2030 which was promulgated with the aim of providing a long-term, cost-effective strategy to meet the electricity demand in South Africa. The IRP 2010-2030 objectives align with Government's in terms of increased electricity supply sourced from renewable sources, as well as broader environmental and social responsibilities. Furthermore, the proposed renewable energy development is in line with the national REIPPPP strategy.

According to the socio-economic specialist report (attached as Appendix G5), *"In terms of national energy planning, the Lejeweleputswa District Municipality (LDM) falls within the Kimberley REDZ (Renewable Energy Development Zone). The purpose of the REDZs, linked to power transmission corridors, is to give effect to the Department of Energy's Integrated Resource Plan (IRP), which identifies an increasing role for renewable energy generation in order to bring down the country's carbon footprint.*

The IRPs are revised and re-issued every year or two. To facilitate roll-out of renewable energy and meet the ambitious targets set in the IRPs, various economic incentives have been initiated to encourage investment in renewable energy, notably the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). Evident from policy is that solar power requires a greater subsidy than the other forms or renewable energy.

A Phase 1 Wind and Solar Strategic Environmental Assessment (SEA), completed by the Council for Industrial and Scientific Research (CSIR) in 2015, identified eight REDZs in South Africa. The SEA set out to identify areas in the country that are best suited for wind and solar PV energy projects, based on a holistic assessment of technical, strategic planning, environmental and socioeconomic criteria (the report is available for download on the CSIR REDZ website). These were gazetted for implementation by the Minister of Environmental Affairs, in February 2018 (CSIR, 2019)[1].

[1] CSIR REDZ website https://redzs.csir.co.za (homepage) as on 15 December 2019

The Kimberley REDZ was positioned clearly because of the location of the Perseus substation, the biggest in the country and a key link in the Central powerline corridor. The powerline corridors with which the REDZ are associated were identified in the Electricity demand that would be suitable for solar PV development. In this way, the combination of the REDZs and power corridors provides strategic guidance to Eskom on where to prioritise investment in grid infrastructure (CSIR, 2019).

The Lejeweleputswa IDP states that an area suitable for a solar power development and carbon credits is situated in the south of Lejweleputswa and continues further into Xhariep (to the west). The primary purpose of the Solar Energy Hub strategy is to use the space and natural abundance of sunshine associated with the Free State Province and to capitalise on the carbon credit opportunities to be unlocked by means of planning (Final Draft Free State Provincial Spatial Development Framework 2014, as reported in Lejeweleputswa 2018)). From the perspective of the District, the solar energy projects at Dealesville and Boshof should be promoted to expand into a solar energy hub for the south-western part of the district. The said towns are also indicated as solar energy nodes on the district spatial development framework (SDF) map (Lejeweleputswa 2018).".

Farms in the vicinity of Dealesville have proved particularly popular as locations for solar PV proposals, presumably because of the presence of the Perseus substation and the relatively low value of agricultural land in the immediate area.

Dealesville is a stagnating town and the development of some of the proposed renewable energy projects in the region will help boost the local economy by injecting capital into the region (mainly during the construction phases of these proposed plants).

5. PROJECT DESCRIPTION

5.1.1. Site Location

Location of all proposed sites:	Visserspan Farm No. 40, approximately 10km northwest of Dealesville and 68km northwest of Bloemfontein, in the Free State Province
Farm / Erf name(s) and number(s) (including Portions thereof) for each proposed site:	Visserspan Farm No. 40, near Dealesville, Tokologo Local Municipality, Lejweleputswa District Municipality, Free State Province Note: see Appendix K (Owner's Consent)
Property size(s) in m^2 for each proposed site:	12 754 069m^2 (only one proposed property and one proposed site for Project 1's 218ha development footprint)
Development footprint size(s) in m^2:	Approximately 2 180 000m^2 (218ha)

Surveyor General (SG) 21 digit code for proposed site:	F00400000000004000000
Local Municipality	Tokologo Local Municipality
District Municipality	Lejweleputswa District Municipality

Table 1: Visserspan Solar PV Facility - Project 1 development locality details

Co-ordinates for the project footprint 'bend points' are indicated in the map attached as Appendix A2 of this BAR.

5.1.2. Site Description

According to the general botanical biodiversity survey done towards the end of 2018 and reported on by the botanical specialist early in 2019 (Appendix G1), only one vegetation type, Vaal-Vet Sandy Grassland, occurs on Farm Visserspan No. 40. Vaal-Vet Sandy Grassland, is listed as an endangered ecosystem in the National List of Threatened Ecosystems promulgated under the NEM:BA (Government Gazette, 2011).

However, due to cattle grazing pressures and the fact that areas of the farm are degraded and have previously been cultivated, it is the professional opinion of the botanical specialist that, except for the no-go area in the south western corner of the farm and the area around the existing farmhouse and the watercourses i.e. pans with a 32m buffer zone around them, the rest of the Farm Visserspan No. 40 *"could all be considered for the construction of solar PV infrastructure"*. (Refer to Figure 10 below).

The no-go area in the south-west of the farm was determined to have biodiversity significance since there is a small deviation from this grassland landcover where trees of *Vachellia karoo* (*Acacia spp*. commonly known as sweet thorn trees) are present. MacDonald (2019) identified this area as a 'no-go' area. The south western corner of the farm was, therefore, excluded from potential land to be considered for placement of Visserspan Solar PV Facility - Project 1's development footprint.

The above-mentioned botanical scan determined the:
(i) vegetation type/s and condition;
(ii) veracity of the existing CBA (conservation status) map;
(ii) sensitivity of the vegetation and
(iv) areas that could be considered for the construction of a PV facility.

Although the BGIS maps included in Appendix B (Sensitivity Maps) indicate that almost all of the development footprint proposed for Project 1 is a CBA 1 area, a site visit to 'ground-truth' the critical biodiversity area (CBA) database classification with the actual site, caused the botanical specialist to *"question the CBA 1 classification imposed on parts of the farm"*.

The regional map in Appendix A4 also indicates that most of the areas immediately surrounding Perseus substation to the north, west and south are, in fact, classified as CBAs. The bulk of REDZ 5 closest to Perseus substation is regard as a CBA. Please refer to Appendices G6a (Botanical Specialist's Letter) and G6c (EAP's Letter) to see a detailed explanation and opinion regarding the questionable CBA classification of the development site.

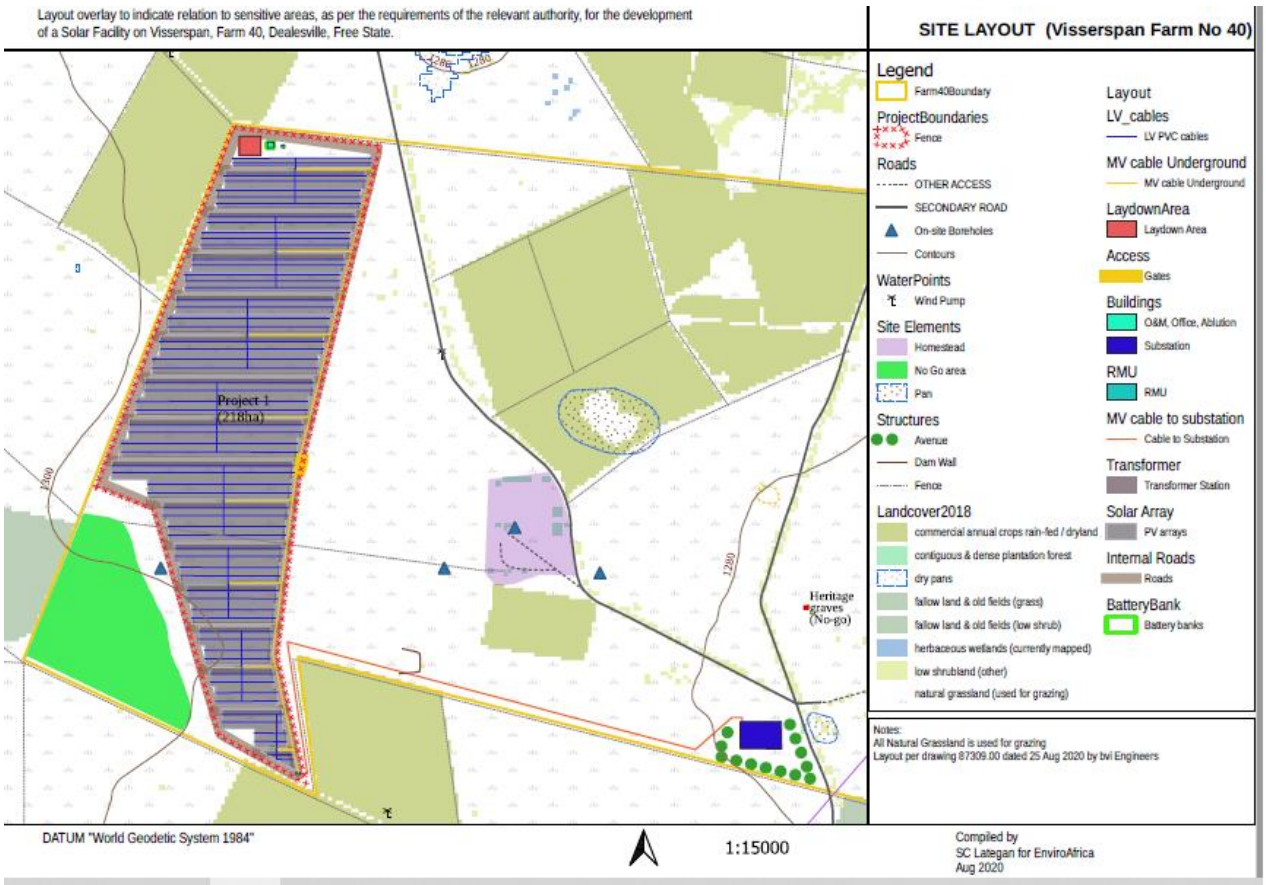

Figure 2: Site layout on **b**otanical/landcover map (larger map included as Appendix A7, attached).

National Biodiversity Geographic Information System (BGIS) maps, attached as Appendix D, do not indicate that the site falls within any formal or informal protected areas which concurs with the findings of Appendix G3c (Visual Impact Assessment Report) which states that the nearest Provincial Nature reserves are Soetdoring Nature reserve (35km from proposed development site) and Sandveld Nature reserve 85km from proposed

development site). There are, therefore, no reserves within potential viewshed area. Please refer to Appendix D – Sensitivity Maps.

Nonetheless, the botanical specialist's stance that the regional or larger scale significance of removal of the Vaal-Vet Sandy Grassland on the site footprint, is low negative may raise some questions. In an explanation letter, attached as Appendix G6a, the botanical specialist reiterates that the current land use of agricultural practice (such as cultivation or grazing), is the main threat or pressure to Vaal-Vet Sandy Grassland. Thus, this vegetation type is only classified as threatened due to all the cultivation which takes place and not because of biodiversity or threatened plant species. The threat of cultivation to the grassland species, is on a much more significant and larger/regional scale than the more localised solar PV development would be.

The topography of Visserspan 40 is relatively flat with a slight rise to the southwest corner of the farm. Generally, a few depressions are found on the farm and they form seasonal pans. Due to the minimal slope across the entire farm, the geo-spatial specialist did not draw up a slope analysis map indicating the relevant ranges of slopes suitable or sensitive to the development. Appendix G6b confirms that the site consists only of slopes of less than 8% with a maximum slope of 4.4%.

The geology consists of aeolian and colluvial sand that has been laid down over sandstone, shale and mudstone of the Karoo Supergroup, mostly Ecca Group. The soil forms are mostly Avalon, Westleigh and Clovelly. Dolerite has intruded the landscape where Vaal-Vet Sandy Grassland occurs (Figure 9) but it does not occur at Visserspan 40 except for a small outcrop in the southwest corner of the farm that is not prominent enough to be mapped.

Visserspan 40 is located in the summer rainfall region and the climate is classified as warm-temperate. Overall mean annual precipitation (MAP) is 530 mm and temperatures are high in summer and low in winter with severe frosts on average for 37 days of the year. The climate diagram (Figure 5) shows the complete lack of rainfall in winter and rain mainly occurring from November to March.

Although there are a few watercourses (specifically pans) on the greater Farm Visserspan No. 40, there are no watercourses on, or within 32m of, the development footprint site for

Project 1, which lies on the extreme western boundary of the farm. Due to the existing water allocation, it is still to be determined if a water use licence authorisation will be required.

Although the topography may appear fairly flat, the landscape is characterised by undulating rises and valleys which create significant visual screening for infrastructure with a low vertical extent. Any structures under 10m can be easily absorbed into the landscape. The general topography of specifically Project 1, is characterised by an increased slope/hill to the south western corner of the proposed development footprint. There is a scattering of mature *Acacia spp*. (sweet thorn trees) on the slopes of this hill and it is therefore indicated by the botanical specialist, as a no-go area in terms of land available for Project 1's development area.

The existing farmhouse and smaller storage buildings which stand more or less central to Visserspan Farm No. 40 and their immediate surroundings, have been indicated as an area not available for development (refer to Figure 2 above). The structures themselves are in a state of disrepair although they are clearly very old (refer to Appendix G3a – Archaeological Impact Assessment).

Photographs of existing buildings and structures on the Larger property of Visserspan Farm No. 40 and included in the archaeological impact assessment report attached as Appendix G3a. Personal communication from the only residents on the farm indicated that the structures are possibly around 125 years old. This concurred with Kaplan (2020) who dates the structures *circa* 1899. The development footprint of Visserspan Solar PV Facility - Project 1 is not adjacent to these buildings, although, the access road to Project 1 will probably pass nearby the structures. Since the existing farmhouse and associated structures have been indicated as in an area excluded from development and is relatively far from Project 1's footprint area.

Directional site photographs have been included as Appendix C of this BAR. Photographs indicating sensitive visual receptors (tourism routes, tourism facilities, etc.) are included in Appendix B (Visual Receptors) of the Visual Impact Assessment Report attached as Appendix G3c of this BAR.

5.1.3. Proposed Development Description

The proponent, Ventura Renewable Energy (Pty) Ltd, plans to establish a solar facility which harvests light energy from the sun using solar photovoltaic (PV) panels and converts the light energy into electrical energy to be fed into the national (Eskom's) electricity grid. The development footprint for proposed Project 1 facility is an area or approximately 218ha on the Farm Visserspan No. 40, near Dealesville, Tokologo Local Municipality, Free State Province. This solar facility is, in essence, a solar power station which is planned to form part of the country's renewable energy electricity generation capacity should the Applicant be successful in it's bid to be selected as an independent power producer (IPP).

The Visserspan Solar PV - Project 1 Facility is proposed to be established on a site located at 28°35'33.46"S, 25°43'21.04"E (approximate centre point), within Renewable Energy Development Zone 5 (REDZ 5) on Visserspan Farm No. 40, about 8km northwest of Dealesville and 70km northwest of Bloemfontein.

Traveling northwest from Bloemfontein along the R64 national road, one passes through the small town on Dealesville. Leaving the R64 and continuing north through Dealesville one passes several farms/areas which have also been earmarked for solar facility developments in the vicinity of Eskom's Perseus substation, the largest sub-station in Southern Africa. The farm Visserspan lies north of Perseus sub-station and is currently the furthest solar PV application site north of Dealesville located in REDZ 5.

The location of the proposed Visserspan Solar PV development in REDZ 5 places the proposed facility within one of the country's strategic transmission corridors. Appendix A (Maps) includes locality (Appendix A1), *status quo* (Appendix A3) and regional (Appendix A4) maps which indicate the geophysical context in which the proposed Visserspan development is placed.
The *status quo* map states in the notes that, "Ridgelines, high potential agricultural land and tourism facilities do not occur on site or within 1km of the proposed site." The status quo map notes further state that "All Natural Grassland is used for grazing. Patches severely degraded. Rotation grazing practiced. Timelapsed satellite imagery indicates degradation. Project 1 area has been rested for more than a year."

The regional and REDZ 5 maps help to further contextualise cumulative impact of the proposed development site within the greater region. Together with the cumulative map of all the potential solar PV developments on the Farm Visserspan itself (which is a smaller,

local impact) and the much larger cumulative impact on a regional scale of the all the renewable energy EIA applications within the REDZ 5, it is evident that should all the proposed renewable energy projects be built, it would be a total change in the visual landscape and sense of place for several kilometres to the north/northwest and south/southwest of Dealesville.

The Visual Assessment Impact report also indicates those applications which have already received approval and mentions the spatial cumulative impact of 'spatial crowding'.

That being said, some proposed solar PV developments are less obtrusive than others, either through the layout or configuration used to collect solar energy, or because the immediate topography or landscape shields the viewer from being exposed to an unobstructed view of the facility. While the proposed Visserspan developments are not as close to Dealesville as most of the other solar developments which have been applied for, it's recommended design and layout is deliberately not CPV or raised PV arrays to reduce visual impact.

The proponent intends to develop Visserspan Solar PV Facility - Project 1, at this particular location since it falls within REDZ 5 which has favourable suitability in terms of solar energy harvest potential, topography, accessibility, tie-in to the Eskom grid and somewhat mitigatable visual and environmental negative impacts. The proposed development layout have been superimposed on the map indicating sensitive features on and around Visserspan, as per Appendix A7.

The proposed development will be a north facing array of poly-crystalline solar photovoltaic (PV) modules most probably grouped into tables or panels of 20 modules each and situated in parallel rows along an east to west axis covering most of the 218ha footprint. It is proposed that Project 1's development footprint will be surrounded by a perimeter fire access road and fence. The actual array of PV panels will not completely fill the 218ha footprint which also needs to cater for infrastructural requirements. It is estimated that the actual solar array will cover an area of approximately 170ha.

Refer Appendix B of to the Visual Assessment Report (attached as Appendix G3c of this BAR) for simulated depictions of the fence and solar panel arrays on the proposed site.

It should be noted that the negative visual impact from the proposed (more ground based) Visserspan solar PV development is much less than that of the visually intrusive arrangement of a CPV plant or even a crystalline PV plant where the panels are raised on 10m to 15m high pedestals.

As per Figure 1 above, the PV tables will be raised approximately 500mm above ground level and will have single axis tracking systems allowing the generation of not more than 100MW of direct current which will be converted to alternating current before being evacuated into the national grid. The actual generation capacity of the facility itself may be a little more than 100MW but a maximum of 100MW will be available to the national grid since the facility will require some power for it own functioning.

Proposed associated infrastructure to be built on the 218ha footprint site includes a fenced construction staging area, maintenance shed/s, inverter-transformer stations on concrete pads with adjacent 12 x 6 battery storage container/bank, a switch panel for connection to the power grid and office buildings with septic tank ablutions. The three-phase, sub-surface, 22kV, electricity evacuation powerlines are planned to run to a proposed future substation on the Vissersapan property (not part of this application process), from where the evacuation power lines will connect with the Eskom grid at the Perseus substation.

The evacuation powerlines internal to the farm Visserspan, are proposed to be subsurface (underground) powerlines until they connect with a proposed substation to be located within Visserspan - towards the eastern boundary of the Farm Visserspan No. 40. It should be reiterated that the HV lines and substation are not being applied for in this application process but will be handled as a separate independent application, once routes have been finalised with Eskom. Electricity is evacuated from a solar PV facility in MWac (alternating current) with the solar PV facility capacity rating being in direct current and measured as a peak value under optimal conditions i.e. MWp.

The maximum generation capacity of the facility is approximately not more than 100MW. Solar PV farms produce electricity in direct current which must be converted into alternating current and transformed into the correct voltage before it can be fed into the national grid. This conversion is done by inverters and transformers which are part of the abovementioned infrastructural development of the project.

Technical details for the proposed facility

Component	Description / Dimensions
Height of PV panels	3m when at full tilt (upper level); 500mm above ground (lower level)
Area of PV Array	Approx. 170m^2 covered by actual PV panels (excluding internal roads)
Number of inverters required	< 800 units
Area occupied by inverter / transformer stations / battery storage banks	< 1ha
Capacity of on-site substation	N/A - No on-site substation
Area occupied by both permanent and construction laydown areas	Permanent: <1ha Construction: <20ha
Area occupied by buildings	<1,5ha
Length of internal roads	<10km
Width of internal roads	Between 4m to 6m wide internal roads but <8m wide internal roads
Proximity to grid connection	Approx. 7km to Eskom's Perseus substation
Height of fencing	Approximately 2,4m
Type of fencing	Galvanised wire or palisade fence (probably electrified)
Solar plant technology type	Crystalline Solar PV
Solar plant structure orientation	North facing
Array generation capacity:	116640kWp
Array capacity at operating condition of 50^{o}C:	103940kWp
Generation capacity of the facility as a whole at delivery points:	Not more than 100MW of generated electricity to be made available at delivery point

Table 2: Summary of technical details for Visserspan Solar PV Facility - Project 1

Description of Development Phases

Equipment and Material Delivery/Site Preparation:

The proposed development site is accessible from larger centres using the R64 (heading into Dealesville) and then utilising the 31999 secondary road to reach the Farm Visserspan No. 40. PV modules and steel structures will be transported to site using interlink trucks. The main transformers, graders and 20-ton rollers will be delivered to site using abnormal load vehicles. In addition to these vehicles, drill rigs, 10m^3 tipper trucks, several tractors and trailers, a waste transport truck, site bakkies, one water tanker truck, track-loader-backhoes (TLBs) and trenching machines, will also be used on site.

The area will be graded and levelled using a 20-ton roller. Water spray from the water tanker truck will be used to control excessive dust blow off. About three to four temporary access roads will have to be established on site in addition to the long-term perimeter fire and main access road. As the site is established, several permanent internal roads between strings of panels will allow access to the panels for inspection and maintenance (Refer to Appendix B – Layout Plans). The existing main access farm road will enable vehicular access to the site within the farm Visserspan. All roads created as part of the solar facility will be untarred / unpaved allowing. It should be noted that cable trenches for the underground laying of cables for evacuated power, will be located along the side (or in the 'reserve') of existing farm roads where the cables run our of the proposed development footprint. Cross sections of subsurface trench design are included in Appendix B.

Construction:

Each drilling machine which will be used for drilling the substructure post holes, is equipped with a dust control system. The system extracts the dust away from the hole while drilling using vacuum. Collected dust can then be removed in a controlled manner from the back end of the machine once a certain amount is reached.

Concrete transformer pads for each row of solar panels, a switch panel for connection to the power grid, and control sheds would be constructed on site

Development of the electrical systems would take place in conjunction with installation of the rest of the structures. In brief terms, it includes all electrical cabling and trenching (field trenching in and around the entire site where the units will be installed should take place after the installing the pedestals) that connects all solar units, collects the energy from them, and then routes it to a point of connection with the utility infrastructure system.

Approximately 30 to 60 people are envisaged to be required during the construction phase, which is expected to last for 6-8 months. Positions will be filled by mostly local labour from the area where possible and are not to be housed onsite.

Operation:

The proposed solar facility is based on the single axis tracking system for adjustment of the panels or tables carrying the solar PV modules. One of the reasons for selecting this tracking system is the configuration flexibility which facilitates good utilisation of the available land and maximises the "pitch" or distance between tables. This minimises the shading effects tables have on each other. Each table is equipped with a bow or curved component which carries a ring gear. The horizontal shafts have short worm gears which run against the ring gears to effect table adjustment. Tracking of the sun in a single axis solar PV system is usually aligned roughly along the north to south axes. The PV farm tracking system can be operated either automatically or remotely. The tracker adjustment range is -50 to +50 degrees. The pitch between tables would be 6m. The tracker controllers are an integral part of the tracking system and they provide backtracking functionality in order to minimise the effects of shadowing.

Solar polycrystalline PV modules will be grouped together in a panel or table which would be mounted with the long edges perpendicular to the tracking axis. All the modules in a table would be electrically interconnected to form a string.

The array of the tables would be connected to 1000kVA, 1000V inverters, the rating being selected to allow for the reactive power requirements of the South African grid code.

During periods of high wind or when undergoing maintenance, the solar arrays would be shifted to a stand-by mode, where the panels are placed in a horizontal position (facing upward and parallel to the ground).

Approximately 100 workers (70 direct and 30 indirect) are envisaged to be required during the operational phase of the proposed solar development (actual numbers to be confirmed). The lifespan of the development is expected to last for about 25 years. Positions will be filled by mostly local labour from the area and are not to be housed on site.

Maintenance:

Periodic maintenance activities involve replacing non-functioning cells or other mechanical parts essential to the operation of the arrays. Trips to the solar PV farm to undertake

maintenance would occur on an as-needed basis. Maintenance visits may not occur immediately after a module ceases to function or a part becomes damaged – the Project Applicant would determine whether the benefit of the maintenance trip outweighs the cost of that additional trip. It is assumed, however, that maintenance visits would occur four to six times per year. Individuals responsible for maintenance activities would most likely commute from regional offices or nearby operating facilities.

Since sunlight can be absorbed by dust and other impurities on the surface of the photovoltaic panels, washings would periodically be needed. An existing borehole exists on Visserspan Farm No. 40 with a water allocation that is far from being fully utilised. The proponent is in discussion with the Department of Water and Sanitation regarding water availability from the existing water allocation for use by the proposed solar PV development has not yet been fully determined. Water utilisation during construction and during operation and maintenance/ad-hoc cleaning events would be required for cleaning the photovoltaic panels. During maintenance, waste separation and recycling will take place as per the facility's environmental management programme.

Decommissioning:

The solar energy facility is expected to have a lifespan of +-25 years. The facility would only be decomissioned and the site rehabilitated, once it has reached the end of its economic viability. Should this happen, then as much of the panels/infrastructure must be recycled and local labour could be used to separate the recyclable material on site.

It is more likely that the facility would be upgraded (due to the enhancement of technology/infrastructure) in the future allowing a continued production of renewable energy. This could be further improved by investigating the potential for agrivoltaic practises such as allowing grass to grow in the development site and using small animals to graze between the panels during operation.

Furthermore, although most large solar PV facilities in South Africa do not encourage growth of grasses between the panel due to the increased fire risk it poses, rehabilitation of the site post closure or even rehabilitation of the open spaces in the facility if the plant is refurbished and 'renewed' (with low growing plants which do not pose a fire risk) could be pursued.

Note: Throughout all phases of the development lifecycle i.e. site preparation, plant construction, operation, maintenance and final decommissioning, waste management in line

with the project's environmental management programme includes waste separation, timely periodic waste removal to registered waste sites and recycling where possible.

Please refer to Appendix D for biodiversity, ecological and protected areas sensitivity maps of the proposed development site.

Botanical/Biodiversity:

According to the botanical biodiversity survey done towards the end of 2018 and report done by the botanical specialist early in 2019 (Appendix G1), only one vegetation type, Vaal-Vet Sandy Grassland, occurs on Farm Visserspan No. 40. Nonetheless, a small deviation from this occurs in the southwest corner of the farm, where trees of *Vachellia karoo* (*Acacia spp*. commonly known as sweet thorn trees) are present. The botanical specialist, Dave MacDonald (specialist declaration included in Appendix L), identified this area as a 'no-go' area. The south western corner of the farm was, therefore, excluded from potential land to be considered for placement of Visserspan Solar PV Facility - Project 1's development footprint.

The above-mentioned botanical scan determined the:
(i) vegetation type/s and condition;
(ii) veracity of the existing CBA (conservation status) map;
(ii) sensitivity of the vegetation and
(iv) areas that could be considered for the construction of a PV facility.

Vaal-Vet Sandy Grassland (Gh10) is listed as an endangered ecosystem in the National List of Threatened Ecosystems (Government Gazette, 2011). The professional opinion of specialist is that, except for the no-go area in the south western corner of the farm, the areas around the existing farmhouse and the watercourses i.e. pans with a 32m buffer zone around them, the rest of the Farm Visserspan No. 40 *"could all be considered for the construction of solar PV infrastructure"*, as per Figure 10 in Appendix G1 (Botanical impact Assessment).

Owing to the widespread occurrence of the principal vegetation type, Vaal-Vet Sandy Grassland and the current pressure this vegetation type is under on the farm Visserspan, it is the botanical specialist's view that the vegetation type *"is not considered to be sensitive at Visserspan"*. This is specific to the impact of the removal of this vegetation type in the

region or larger scale where the botanical specialist rated the loss of Vaal-Vet Sandy Grassland to be 'low negative' (although on a local/smaller scale of just Visserspan Farm the loss would be rated as 'high negative').

Although the BGIS maps included in Appendix B (Sensitivity Maps) indicate that almost all of the development footprint proposed for Project 1 is a CBA 1 area, a site visit to 'ground-truth' the critical biodiversity area (CBA) database classification with the actual site, caused the botanical specialist to *"question the CBA 1 classification imposed on parts of the farm"*.

Please refer to Appendices G6a and G6c for further explanation letters from the botanical specialist and EAP, respectively.

BGIS maps do not indicate that the site falls within any formal or informal protected areas which concurs with the findings of Appendix G3c (Visual Impact Assessment Report) which states that the nearest provincial nature reserves are Soetdoring Nature reserve (35km from proposed development site) and Sandveld Nature reserve 85km from proposed development site). There are, therefore, no reserves within potential viewshed area.

Please refer to Appendix D – Biodiversity Sensitivity Maps.

Although there are a few watercourses (specifically pans) on the greater Farm Visserspan No. 40, there are no watercourses on, or within 32m of, the development footprint site for Project 1, which lies on the extreme western boundary of the farm.

Due to the existing water allocation, it is still to be determined if a water use licence authorisation will be required. However, although the watercourses have been deliberately avoided in terms of the NEMA with respect a 32m setback allowance, listed activities in terms of the National Water Act, No.

Although the topography may appear fairly flat, the landscape is characterised by undulating rises and valleys which create significant visual screening for infrastructure with a low vertical extent. According to the visual impact specialist, *"any structures under 10m can be easily absorbed into the landscape".*

The general topography of specifically Project 1, is characterised by an increased slope/hill to the south western corner of the proposed development footprint. There is a scattering of mature *Acacia spp*. (sweet thorn trees) on the slopes of this hill and it is therefore indicated by the botanical specialist, as a no-go area in terms of land available for Project 1's development area.

It should be noted that a faunal specialist was not part of the biodiversity assessment – the focus was primarily on botanical biodiversity. It is known that there are several faunal species found in the area but none are endangered or threatened. From a desktop study it appears that only the Road Antelope is considered Vulnerable (almost all the mammal, reptile, amphibian and lepidoptera species are classified as Red List Category 'Least Concerned'. However, The EMPr does provide for search and rescue of faunal and floral species should the Environmental control officer or regulating authority deem it necessary e.g. for tortoises or toads during construction.

The Dealesville area lies in a summer rainfall region with the climate being classified as 'warm-temperate'. Mean annual precipitation (MAP) averages 530 mm. Temperatures are high in summer and low in winter with severe frosts on average for 37 days of the year. There is a complete lack of rainfall in winter with rain falling primarily from November to March.

Freshwater:

Dirk van Driel of Watsan Africa was responsible for freshwater specialist studies undertaken on Visserspan Farm No, 40.

According to the freshwater specialist, there are no watercourses on the proposed development site for Visserspan Solar PV Facility – Project 1.

Water use licence processes may still need to undertaken to address the proposed use of water for the project from the existing groundwater allocation available to the farm (which is underutilised) but this allocation, or the authorisation process for the possible extraction of groundwater and harvesting of rainwater for the facility, will need to be addressed with the Department of Water and Sanitation in a separate application process.

The general geology of the Farm Visserspan No. 40 comprises aeolian and colluvial sand that has been laid down over sandstone, shale and mudstone of the Karoo Supergroup, mostly Ecca Group. The soil forms are mostly Avalon, Westleigh and Clovelly. Dolerite has been known to 'intrude the landscape' where Vaal-Vet Sandy Grassland occurs but only does so for a small outcrop in the southwest corner of the Visserspan farm that is not very prominent at all.

Heritage:

Archaeological, paleontological and visual (including sense of place) specialist studies have been undertaken for the proposed development. The independent specialist reports are attached as appendices G3a, G3b and G3c, respectively.

Final comment from the South African Heritage Resource Agency (SAHRA), is included in Appendix E6 (Correspondence from Organs of State) of the final BAR.

Archaeological:

A field assessment by Jonathan Kaplan of ACRM of the proposed Visserspan Solar PV Facility took place between the 30th of November and the 3rd December 2019.

According to the specialist archaeological impact assessment (as per Appendix G3a), no archaeological resources were recorded in the proposed development footprint area for Visserspan Solar PV Facility – Project 1.

In terms of the total Visserspan Farm property, the archaeological impact assessment further states that, "archaeological resources have been rated as having LOW (Grade IVC) significance since, generally, relatively small numbers of archaeological remains were found in other areas of the farm (not part of Project 1's site) and were isolated and were found in a disturbed context.

No evidence of any Late Iron Age archaeological heritage was noted during the field assessment, which appears to be absent from the study area.

No evidence of any Anglo-Boer War battlefield sites (1899-1904), war graves or memorials were encountered during the study".

No mitigation of archaeological resources is required prior to construction activities commencing.

However, historic (c. 1899), calcrete and clay, sheep and cattle enclosures within the farm werf must not be disturbed, damaged or altered in any way by activities. The structures are protected under Section 34 of the National Heritage Resources Act (No. 29 of 1999) and cannot be disturbed in any way without a permit issued by SAHRA. These structures have been left out of the proposed development footprint and are considered a no-go heritage area.

If any human burials are uncovered during construction activities then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and will require inspection by a professional archaeologist.

Palaeontological:

On 11 January 2020, John Almond of Natura Viva CC and an experience field assistant undertook the palaeontological impact assessment of the proposed development site.

According to the specialist palaeontological impact assessment report attached as Appendix G3b, it was *"concluded that the palaeontological sensitivity of the solar PV project area on Farm Visserspan No. 40 near Dealesville is low. Anticipated impacts on local palaeontological heritage resources from the construction phase of the developments are accordingly also of LOW SIGNIFICANCE.*

This applies equally to all four of the proposed solar PV facilities whose cumulative impact significance would also be LOW.

No further significant impacts are expected during the operational and decommissioning phases of the developments.

There are no fatal flaws in the development proposals".

The palaeontological specialist further states that provided that the recommended mitigation measures as detailed in the Palaeontological Impact Assessment Report (as per Appendix G3b) are fully implemented, there are no objections on palaeontological heritage grounds to authorisation of the proposed Visserspan Solar PV Facility.

Should fossil remains such as bones, teeth, shells or petrified wood be discovered before or during the construction phase, these should be safeguarded (preferably in situ) and the ECO should alert the South African Heritage Resources Agency, SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Phone: +27 (0)21 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za).

This is so that appropriate mitigation e.g. recording, sampling or collection, can be taken by a professional palaeontologist (See tabulated Chance Fossil Finds Procedure appended to Palaeontological Impact Assessment Report in Appendix G3b of this report and Appendix 19 of the EMPr).

The specialist involved would require a collection permit from SAHRA. Fossil material must be curated in an approved repository (e.g. museum or university collection) and all fieldwork and reports should meet the minimum standards for palaeontological impact studies developed by SAHRA (2013).

The SAHRA Archaeology, Palaeontology and Meteorites (APM) Unit has reviewed the heritage related specialist studies appended to this final BAR and states that since no heritage resources will be impacted by Visserspan Solar PV Facility – Project 1, and the sensitivity of palaeontological resources is considered low, SAHRA APM has no objections against the proposed development subject to the specialists' recommendations and the conditions as outlined in the SAHRA's final comment (as per Appendix E6).

Visual:

Sarien Lategan was appointed to undertake the visual impact assessment for the Visserspan PV Facility, Project 1, near Dealesville, Free State. The term visual and

aesthetic is defined to cover the broad range of visual, scenic, cultural, and spiritual aspects of the landscape. It also includes the impact on 'sense of place' of the area.

At the time of assessment, detail regarding the exact technology and site layout was not yet available. The most probable technology would be Single axis tracking PV arrays, with an assumed maximum vertical height of 3m. Should a different technology thus been decided on which involve smaller units, the visual impacts will certainly be less than what is assessed in this report.

The viewshed of the site is limited by the topography which is characterized by low undulating rises and valleys which created a medium level of visual absorption. Due to the low vertical extent of the proposed development, this absorption rate is sufficient to reduce the viewshed for the particular project proposal.

An assessment of the potential visual receptors through the use of landscape profiles coupled with on-site verification was undertaken. The visual receptors in the area are of medium to low sensitivity. The assessment finds that the overall visual impact of the proposed Project 1 of the Visserspan PV facility holds a low overall visual impact. For this reason, no mitigation measures are required.

Due to the fact that a number of PV facilities have been approved to the south of Project 1, the project does contribute to the cumulative impact specifically to spatial crowding. The pro rate contribution to the overall number of approved projects is however low. Since no thresholds have been determined on a regional level it is not appropriate to assess the impact on landscape change.

The proposed site is situated in a rural area with natural *Acacia spp.* trees, as well as planted alien invasive (*Eucalyptus spp.*) vegetation. The area displays a rural character with low intensity farming, game farming and natural areas. The Eskom (Perseus) substation is relatively close to the site and an HV power line servitude runs to the east of the Farm Visserspan No. 40 towards Perseus substation in the south.

Soil, Land Use and Agricultural Potential Impact Assessment:

Terra Soil Science, represented by Johan van der Waals, was appointed by EnviroAfrica CC to undertake the soil properties, land capability and agricultural potential assessment.

Due to the soil properties, land use for the type of land found on the proposed development site, is extensive grazing due to climatic constraints.

According to the specialist, *"land capability mimics the land use" and "the agricultural potential in terms of dryland cropping is low due to lower than 500 mm rainfall per annum, with grazing potential being dependent on rainfall and management"*.

It was concluded by the specialist that *"the proposed development of a photovoltaic facility on the site will not have large impacts due to the low agricultural potential of the site as well as the rainfall that is below 500 mm pa.*

The impacts on the site need to be viewed in relation to the opencast mining of coal in areas of high potential soils – such as the Eastern Highveld. With this comparison in mind the impact of a solar energy facility is negligible compared to the damaging impacts of coal mining – for a similar energy output. Therefore, in perspective, the impacts of the proposed facility can be motivated as necessary in decreasing the impacts in areas where agriculture potential plays a more significant role".

Socio-economic:

Caroline Henderson representing EMC^2 conducted the socio-economic survey for the proposed project. As such, the specialist has indicated "*no strong opinion, from a socio-economic point of view, as to whether the Visserspan solar PV projects should be permitted, either singly or together*" but notes positive and negative factors regarding the Visserspan Solar PV Project.

Factors supporting a positive decision as listed in the socio-economic report:

- *"The proposals are aligned with the State's energy security, energy generation and carbon footprint policies and plans;*
- *The proposed projects are aligned with spatial plans for the sub-region in which they are proposed*
- *The nation will benefit from enhanced energy security and reduced carbon footprint*

- *The land to be developed is relatively low capacity, low value grazing land, will have no significant effect on present grazing activities linked to the property*
- *The development of Project 1 will in itself have no discernible effect on broader farming life styles in the area*
- *The significantly poor portion of the Dealesville community and residents will benefit from job opportunities offered by one or more of the projects, even though the number of jobs on offer will be limited*
- *Developmental opportunities will be afforded to the Tokologo Local Municipality, particularly Dealesville itself, by means of the increased circulation of money, generated by each project and collectively by the four solar PV projects, in the local economy".*

Factors supporting a negative decision as detailed in the socio-economic report:

- *"Other economic opportunities for local communities will be limited because this is new, sophisticated technology of which economically active residents in the area have little experience. Economic displacement may thus be equally likely as economic benefit.*
- *Project 1 abuts the largest number of other farm properties, hence has the greatest potential for impacts to neighbouring owners and residents, although there are no residents within 1 km of the boundaries.*
- *The cumulative effect of a large number of solar PV array developments in the Dealesville area will negatively affect the landscape quality, 'sense of place' of the sub-region and tourism activities in some parts.*
- *The Dealesville community's interests are not uniform nor unified: there is a significant body of farmers who are opposed to solar PV development in the area on the basis of its potential to reduce property values, reduce the land area available for productive farming, and disrupt the farming lifestyles that have prevailed here for generations".*

At the same time, there are farmers who are in support of the solar PV developments since they stand to benefit directly from servitudes or leases of their land. The declaration of the REDZ 5 has been an issue of contention among the farming community causing a divide between those who would directly benefit from the proposed developments and those who, directly and indirectly, would suffer losses of one form or another due to the developments.

Civil and Electrical Services:

Electricity for the solar PV facility itself will be sourced from the power generated since will be sourced from the nearest municipal power point i.e. the nearest metered municipal alternating current (AC) power supply point.

The proposed development of a telecommunication mast will not produce waste or use water during its operational phase. The small amount of domestic waste produced during construction will be removed for disposal at the nearest registered municipal waste site.

Access

New internal access roads will be constructed but external access to the Farm Visserspan and Projects 1's site will take place via the existing R64 tar road and the 31999 and 31724 dirt/gravel secondary roads, as well as on existing farm roads within Visserspan Farm No. 40. The proposed site lies on the far western boundary of the Farm Visserspan No. 40 and internal road and tracks exist but some may need to be formaly graded and/or widened.
SANRAL notification/comment has been requested as per Appendices F2 and F3 (Public Participation) but is still not forthcoming.
Please refer to Appendices A (Maps) and B (Site Layout Plans) to see accessibility to the proposed development site, as discussed above.

6. LEGAL REQUIREMENTS

6.1. General Environmental Requirements

The National Environmental Management Act, No.107 of 1998 (NEMA), as amended, makes provision for the identification and assessment of activities that are potentially detrimental to the environment and which require authorisation from the competent authority based on the findings of an Environmental Assessment.

NEMA as a national act, is enforced by the national Department of Environment, Forestry and Fisheries (DEFF). Typically, these powers are delegated to the provincial department of environmental affairs but since the legislated (or listed) activity which results from the proposed development, occurs in an area of strategic importance identified in terms of Section 24(3) of NEMA, namely in a Renewable Energy Development Zone (REDZ) and associated strategic transmission corridor, DEFF is the competent authority for this environmental authorisation application.

According to the regulations of Section 24(5) of NEMA, authorisation is required for NEMA listed activities. The following NEMA listed activities as per the 2014 EIA regulations (as amended) were evaluated for applicability:

According to the regulations of Section 24(5) of NEMA, authorisation is required for the following listed activities:

NEMA, EIA Regulations Listing Notice 1 of 2014 (GN. R. 327)

While infrastructure for the transmission of electricity within the proposed solar PV facility itself will be required, this will be via 22kV lines and does not trigger a listed activity. It is proposed that all internal powerlines be sub-surface lines.

Activity No. 14:
The development of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres (m^3) or more but not exceeding 500m^3.

Note: The proposed facility will utilise a battery storage system to ensure reliability of supply considering the fluctuating power output of a solar PV system. Batteries may be defined as 'dangerous goods' as per South African National Standards (SANS) 10234 due to the toxicity of their contents e.g. vanadium redox or lithium ion batteries and/or the flammability of the batteries.

NEMA, EIA Regulations Listing Notice 2 of 2014 (GN. R. 325)

Activity No. 1:
The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20MWs or more.

Activity No. 15:
The clearance of an area of 20ha or more of indigenous vegetation.

NEMA, EIA Regulations Listing Notice 3 of 2014 (GN. R. 324)

Activity No. 2:

The development of reservoirs, excluding dams, with a capacity of more than 250m³.

b. Free State

ii. Outside urban areas:

(dd) Critical biodiversity areas (CBAs) as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans

Note: The construction and effective operation of the proposed solar PV facility will require cleaning and maintenance (periodic washing) of the PV panels. It is not known if water will be supplied directly from the existing borehole on site, of if water will be stored in reservoirs/tanks at various points in the proposed facility to service the facility. According to the South African National Biodiversity Institute's (SANBI's) Biodiversity Geographic Information System (BGIS), parts of the proposed development footprint occur within a CBA and an ESA.

Activity No. 4:

The development of a road wider than 4 metres (m) with a reserve of less than 13,5m.

b. Free State

ii. Outside urban areas:

(ee) CBAs as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans

Activity No. 10:

The development of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 30m³ or more but not exceeding 80m³.

b. Free State

ii. Outside urban areas:

(ee) CBAs as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans

Activity No. 12:

The clearance of an area of 300m^3 or more of indigenous vegetation.

b. Free State

ii. Within CBAs identified in bioregional plans;

iv. Areas within a watercourse or wetland; or within 100m from the edge of a watercourse or wetland

Activity No. 14:

The development of;

(ii) infrastructure or structures with a physical footprint of 10m^2 or more;

where such development occurs;

(c) if no development setback exists, within 32m of a watercourse, measured from the edge of a watercourse;

b. Free State

i. Outside urban areas:

(ff) CBAs or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.

Possible authorisation is required for the following NEMA listed activities:

NEMA, EIA Regulations Listing Notice 1 of 2014 (GN. R. 327)

Activity No. 9(i):

The development of infrastructure exceeding 1000m in length for the bulk transportation of water or storm water;
(i) with an internal diameter of 0,36m or more; or
(ii) with a peak throughput of 120 litres per second or more;
excluding where;

a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve;

Note: It is a recommendation of the BAR that groundwater, used internal to the facility for ablutions and the maintenance/periodic washing of the solar panels, be transported in pipes with an internal diameter of around 160mm i.e. 0,16m. Should this recommendation

be acceptable to the final engineering specifications, then listing notice 3, activity 9(i) will not be triggered

Activity No. 12(xii)(c):

The development of;

(x) buildings exceeding 100m^2 in size;

(xii) infrastructure or structures with a physical footprint of 100m^2 or more;

where such development occurs;

(c) if no development setback exists, within 32m of a watercourse, measured from the edge of a watercourse;

Note: Listed activity 12(xii)(c) may not be triggered depending on final layout arrangements of the facility. This DBAR recommends that 32m buffer zones around any water courses be maintained. If this is adhered to in final layout plans, then authorisation for listed activity 12(xii)(c) will not be required.

NEMA, EIA Regulations Listing Notice 2 of 2014 (GN. R. 325)

Activity No. 9:

The development of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275kV or more, outside an urban area or industrial complex.

Other legislative requirements, pertinent to the proposed project, include but are not limited to those detailed below.

6.2. Other legislative and guideline documents:
(List not exhaustive)

Relevant Act/Notice:	Site or Project Specific Applicability/Description
National Water Act, No. 36 of 1998	Possible water use licence or general authorisation application for use/extraction of groundwater or confirmation of allocation, mas well as for potential Section 21 listed activities.
National Environmental Management: Biodiversity Act, No. 10 of 2004	Control of alien invasive species
National Environmental Management: Protected Areas Act, No. 31 of 2004	Assessment of proposed development location in terms of Act.

National Environmental Management: Air Quality Act, No. 39 of 2004	Adherence to legal requirements during construction, operation and maintenance.
National Environmental Management: Waste Act, No. 59 of 2008	Adherence to legal requirements during construction, operation and maintenance.
National Forests Act, No. 84 of 1998	Comment (possible permit or licence application) in terms of protected tree/flora species damage or removal – botanical survey did not indicate any protected species.
Conservation of Agricultural Resources Act, No. 43 of 1983	Possible relevance in terms of utilisation and protection of vleis, marshes, water sponges and water courses.
National Heritage Resources Act, No. 25 of 1999	Adherence to Section 38 of Act.
National Road Traffic Act, No. 93 of 1996	Compliance with Act in terms of transportation of abnormal loads to project site.
South African National Roads Agency Limited (SANRAL) and National Roads Act, No. 7 of 1998	Sub-surface crossing of the secondary dirt/gravel road/s will be required and SANRAL
Civil Aviation Act, No.13 of 2009 and Civil Aviation Regulations (1997)	This application does not include the power lines for evacuation of electricity into the national grid. However, this application proposes that any internal facility and electricity/power evacuation lines which will eventually tie in with the main Eskom lines, along predetermined servitudes, run underground (sub-surface)
Civil Aviation Authority Act, No.40 of 1998	Possible above surface structures (overhead powerlines for tie in to Eskom HV lines requiring obstacle application process)
Astronomy Geographic Advantage Act, No. 21 of 2007	Comment required regarding potential setbacks and visual impact mitigation.
National Veld and Forest Fire Act, No. 101 of 1998	Adherence to firebreak establishment and maintenance.
Fencing Act, No. 31 of 1963	Adherence to fencing and access control specifications.
Free State Nature Conservation Ordinance, No. 8 of 1969	Assessment of protected or endangered species.
Spatial Planning and Land Use Management Act, No. 16 of 2013 (SPLUMA)	A consent use and change in land use planning application in terms of Section 35 of the SPLUMA regulations and Section 37 of the Free State Guideline Bylaw on Municipal Land Use Planning.
Subdivision of Agricultural Land Act, No. 70 of 1970	Possible applicability in terms of route for evacuation power lines and tie-in to substation.
Tokologo Municipal Land Use By-law	Rezoning application must be lodged in terms of the Municipal Land Use Planning By-law of the applicable municipality (e-lodgement)

Occupational Health and Safety Act, No. 85 of 1993 and Construction Regulations (2003)	Adherence to Health and Safety requirements and construction regulations during project development and operation.
Hazardous Substances Act, No. 15 of 1973	Adherence to legal requirements during construction, operation and maintenance.
Promotion of Administrative Justice Act, No. 3 0f 2000	Transparent and fair public participation process for proposed development.
Constitution of the Republic of South Africa Act, No. 108 of 1996	Adherence to Section 24 (environmental rights and responsibilities)
Electricity Act, No. 41 of 1987 and Electricity Regulation Amendments (2009)	Compliance with requirements to tie-in to the national grid.
Integrated Resource Plan (IRP) for South Africa (2010)	The proposed development will form part of the Renewable Energy Independent Power Producers Procurement Process (REIPPPP) bidding window 5.
Energy Efficiency Strategy of the Republic of South Africa (2005)	Laid the foundation for the IRP (2010) and need to shift towards renewable energy in the country's energy mix.
United Nations Framework Convention on Climate Change (1992)	Promotion of a move away from a coal-based energy supply to a more sustainable one (renewable energy) such as the proposed development.
Kyoto Protocol (1997)	South Africa acceded to the Protocol in 2002

Table 3: Summary of legislative and guideline documents for Visserspan Solar PV Facility

7. ALTERNATIVES

7.1.1. Location Alternative:

In terms of location, only one development site on the Farm Visserspan No. 40 has been considered for the Proposed Solar PV Facility Project 1, due to its strategic placement and availability for lease within REDZ 5.

It should be noted that the proponent has proposed a total of four solar PV developments on the Farm Visserspan No. 40. However, each proposed facility is being treated as an independent environmental authorisation application with its own impact assessment process. Each of the four proposed Visserspan solar PV facilities differs in generation capacity, footprint size and environmental parameters/constraints, and provided environmental authorisation is received, will be bid as an independent facility in the next REIPPPP (bidding round 5) which is expected to take place before the end of 2020.

7.1.2. Activity Alternative:

With regards to potential activity alternatives, the primary activity proposed is t*he development of facilities or infrastructure for the generation of electricity from a renewable resource where-*

(i) the electricity output is more than 10 megawatts (MWs) but less than 20MWs; or

(ii) the output is 10MWs or less but the total extent of the facility covers an area in excess of 1 hectare (ha);

provide electricity from a renewable energy source. re are no cellular network coverage alternatives since this is the only activity that can increase the specific ICT coverage required for the area.

7.1.3. Design/Technology Alternative:

The proponent, who has successfully developed smaller solar PV facilities in the Northern and Western Cape Provinces, always considers at least three possible technology alternatives for any potential solar PV development they undertake *viz.* a concentrated solar PV (CPV) facility, a crystalline PV facility and a thin film PV cell plant.

An analysis of the three alternate technologies is presented below and is further summarised in detail, in Table 1 - Comparison of Alternate Solar PV technologies:

Analysis of solar PV technology alternatives for Visserspan Solar PV Facility:

Solar PV systems and solar CPV systems differ only in the mechanics by which the cells making up the respective systems, capture and convert sunlight into direct current (DC) electricity.

PV systems come in three broad categories of cell type: mono-crystalline, poly-crystalline and thin film. The active panels are large and virtually the whole surface area is made up of PV cells.

In contrast, in CPV systems, the so-called ‘multi-junction’ cells are small (10mm x 10mm or smaller) and sunlight is focused onto these cells by some form of lens. The active ‘multi-

junction' cell material thus only constitutes a small fraction of the surface area of the CPV system.

Mono- and poly-crystalline systems differ only in the manufacture of the silicon wafers used as the basic building blocks of the PV cell. In the case of mono-crystalline cells, as the name suggests, large single crystals of quartz are grown and then cut into thin quartz wafers. In the case of poly-crystalline cells, multiple interlocking quartz crystals are grown and then cut into thin wafers, with each wafer having multiple (poly = many) quartz crystals. The performance of both mono- and poly-crystalline PV panels is very similar with actual performance output linked more to the quality of the quartz and the manufacturing process than to whether they are mono- or poly-crystalline. Both versions of crystalline PV are currently the most widely deployed and tested PV systems, globally.

There are a number of different varieties of thin film PV cells available. In all cases, various thin layers of material are coated on an appropriate substrate that is often glass. The main variants include amorphous silica (a-Si), Cadmium telluride (CdTe) or Copper Indium Gallium Selenide (CIGS). Thin film PV is generally less efficient at converting sunlight into electricity than crystalline PV but is it also generally less expensive to manufacture. In addition, it has a lower temperature degradation efficiency than crystalline PV.

In both PV and CPV systems, once sunlight has been converted into dc electricity, the so-called 'balance-of-systems' are essentially identical. Inverters convert the electricity from DC to alternating current (AC) and step-up transformers increase the voltage to the appropriate level to facilitate connection, or tie-in, to the national grid (typically, 11-22kVA).

In choosing which solar PV technology is most appropriate for a particular site or project, a number of factors come into play, many of which have as much to do with external socio-economic benefits, as they do with technical efficiencies. EIA studies on potential solar sites should, as a matter of course, look at the impacts of all variants of solar PV technologies as the eventual choice of technology is very often driven by the external factor of funder risk-preference/perception.

Table 1 below, outlines some of the factors were considered when making the final decision as to which of the solar PV technologies (and design) to use on a specific site, for a specific project.

Factor	Thin film PV	Crystalline PV	CPV	Comments
Direct Normal Irradiation (DNI)	Less appropriate	Less appropriate	More appropriate	CPV systems rely on DNI. There is a requirement for the system to be at right angles to the incoming radiation in order to focus the energy on the multi-junction cell.
Global Horizontal Irradiation (GHI)	More appropriate	More appropriate	Not appropriate	GHI is more appropriate to PV systems as they are able to make use of both direct, as well as scattered and reflected sunlight (no focussing is required).
Cloud Cover	Reduced output	Reduced output	Major reduction in output	CPV systems are far more sensitive to cloud cover than PV systems and output is severely reduced.
Temperature	Lower drop-off in performance with increasing temperature than crystalline PV	Significant drop-off in performance with increasing temperature	Lowest drop-off in performance with increasing temperature than crystalline PV	Electricity output may decrease by as much as 10% in high temperature environments for PV systems. Thin film systems perform better than crystalline systems at high temperature and CPV systems perform the best (least reduction in output).
Space Efficiency	> 2ha/MW	+- 2ha/MW	< 2ha/MW	Space requirements per MW are thin film PV > crystalline PV > CPV.
Fixed Tilt Possible	Yes	Yes	Yes	PV systems are most commonly installed as fixed-tilt systems, with the optimum tilt angle a function of latitude. CPV systems have to have two-axis tracking in order to remain at right angles to the incident radiation.
Single Axis Tracking Possible	Yes	Yes	No	PV systems are frequently installed on single axis tracking systems, particularly when space is at a premium. As above, CPV cannot operate other than with a dual axis tracking system.
Dual Axis Tracking Possible	Yes	Yes	Yes, essential	Dual axis tracking is essential for CPV systems. It is also available for PV systems but is not essential and is not as common as fixed-tilt or single axis tracking. When used for PV systems, the economics of the added efficiency need to be weighed up against the additional cost and the increased operating and maintenance costs and complexity.

Output per Installed MW	Function of cell efficiency and GHI	Function of cell efficiency and GHI	Function of cell efficiency and DNI	Output for CPV in high DNI areas (i.e. few cloudy days) is generally much higher (+ 30%) than for fixed-tilt PV. This difference is obviously less pronounced when comparing CPV to dual axis tracking PV. However, dual axis tracking PV is not common and is often an 'add-on', whereas in CPV systems it is integral to the system
Cost per Installed MW (AC)	$1.60-$2.10	$1.80-$2.10	$2.40-$3.00	These are indicative prices for full turnkey costs including grid connections costs in the current South African market. These prices are for AC MW delivered to the national grid buzz bars.
Solar Market Share	< 5%	> 95%	> 0.1%	PV, with CPV representing about 0.1%, dominates the current world market share. This is likely to change in the future and the figure to watch is the new-market share, rather than basing figures on the existing installed base.
Ease of Financing	Less easy	Easy	Difficult	PV is extremely well established and has a proven track record. It is thus easy to finance, both from a debt and equity perspective. CPV, on the other hand, is an emerging technology, with a shorter track record and is accordingly generally more difficult to finance.
Job Creation	Reasonable during construction, low during operation	Reasonable during construction, low during operation	Reasonable during construction, low during operation	Both PV and CPV will create a fair number of jobs during the construction phase, with PV most likely creating more jobs than CPV, albeit of a lower-skilled nature. Neither PV nor CPV will create many operational jobs, with the jobs created by CPV exceeding those created by PV (more complex systems requiring more maintenance).
Local Manufacturing Job Creation	Limited, unless large pipeline of MW available to single manufacturer	Limited, unless large pipeline of MW available to single manufacturer	Good potential	The nature of CPV systems more or less dictate a large component of local manufacture. The lenses that focus the sunlight are located some distance from the multi-junction cells and are installed in a metallic box-like structure that is neither practical nor economic to transport long distances. CPV manufacturing facilities can be economically justified on modest production pipelines that are an

				order of magnitude less than the equivalent PV pipelines required to localise manufacture.
Ground Cover and Shading	Extensive, fixed	Extensive, fixed	Minimum, variable	Fixed-tilt, ground-mounted PV systems feature blanket ground cover and shading with some relief from spacing between rows of panels. CPV systems are generally pedestal-mounted and have moving shading patterns as they track the sun. CPV systems thus have a very small ground footprint.
Topographic Conditions	Flat ground preferred	Flat ground preferred	Flat ground preferred	Both PV and CPV systems are most easily constructed on flat ground. CPV systems are, however, more easily adapted to gently undulating topography than PV systems due to their pedestal versus rack mounting.
Visual Impacts	Low	Low	Medium	Ground-mounted fixed-tilt PV systems have a low visual impact and if necessary can be hidden by suitable screens or walls. Most CPV systems are visually more conspicuous (generally much higher structures).

Table 4: Comparison of Alternative Solar PV technologies

Alternative 1 (Preferred Alternative) – Poly-crystalline Solar PV Modules

The preferred technology in this application is the solar poly-crystalline PV module, on a ground mounted, single axis tracking system. Refer to Table 1 – Comparison of Alternate Solar PV technologies. This alternative also has the least impact in terms of the screening tool themes in the DEFF Screening Tool Report (as per Appendix H):

The property belongs to the Bredenkamp Familie Trust (TMP 2131/1992) and comprises approximately 1275.4069ha in total. The nature of the site required for renewable energy generation projects often means that topographically, not many site alternatives are possible. Roughly 900ha of the Farm Visserspan No. 40 was taken into account and the most suitable portion of 218ha for Visserspan Solar PV Facility – Project 1, was identified with regards to the following specifications:

- **Size**: 218ha development footprint area required

- **Landowner consent**: The Bredenkamp Familie Trust (TMP 2131/1992) has provided consent (as per Appendix K)
- **Available access**: The site can be accessed from the R64, using existing secondary roads *viz.* the 31999. However, additional access roads will have to be established on site.
- **Locality to nearest tie-in to the national electricity grid:** The Eskom (Perseus) electricity sub-station is approximately 3km south of the site for easy connectivity.
- **Topography**: The proposed site is located on an almost level area. With a small hill towards the south west but this area is a no-go area due to the *Acacia spp.* present.
- **Agricultural Potential**: Refer to Appendix G4 (Soil, Land Use and Agricultural Potential Survey). The site has a low dryland cropping agricultural potential more suited to grazing.
- **Biodiversity**: The dominant vegetation type found on Visserspan Farm No. 40 is Vaal-Vet Sandy Grassland, an endangered (A1) vegetation type (Government Gazette, 2011). The proposed development would result in a high local loss of this vegetation type (habitat) and loss of ecological functionality. Mitigation options are minimal to zero and the impact at a local scale is thus **High Negative.** However, since the Vaal-Vet Sandy Grassland is an extensive system and not confined to Visserspan, the cumulative impact would be **Low Negative** and loss of resources would be low particularly when considering the grazing and other pressures the land is subject to. Owing to the widespread occurrence of the principal vegetation type, Vaal-Vet Sandy Grassland, the botanical specialist holds the view that Vaal-Vet Sandy Grassland is not sensitive at Visserspan. The classification of areas as CBAs and ESAs on the farm was also questioned and it was stated that the ESAs and degraded areas are incorrectly mapped. Even though the grassland on the proposed site is of a good condition, this could simply be due to the fact that the area was 'rested' for the past year (*pers. comm.* Visserspan Farm Manager). Consequently, the development of Solar PV Project 1 at Visserspan is supported from a botanical (vegetation) perspective.

- **Freshwater**: There are no watercourses on the proposed development site for Visserspan Solar PV Facility – Project 1
- **Archaeological**: No objections on archaeological grounds to the proposed development being authorised. Refer to Appendices E6 (Comments from SAHRA) and G3a (Archaeological Impact Assessment).
- **Palaeontological**: No objections on archaeological grounds to the proposed development being authorised. Appendices E6 (Comments from SAHRA) and to Appendix G3b.

- **Visual:** The proposed site is situated in a rural area with some natural trees and cultivated alien invasive (*Eucalyptus spp.*) trees . The area displays a rural character with low intensity farming, game farming and natural around further east on the farm. The Eskom (Perseus) substation is in close proximity to the site and an HV power line servitude runs to the east of the Farm Visserspan No. 40 towards Perseus substation in the south. Due to the topography, slope of land and the lower height (maximum of 3m above ground level), the overall visual impact has been rated as low. Refer to the Visual Impact Assessment (as per Appendix G3c) and particularly the simulated pictures of the proposed development on site as viewed from different view receptors.

Alternative 2 (Not Preferred Alternative) – Concentrated PV System

The solar PV technology initially assessed due to its high output during direct normal irradiation (DNI) was the concentrated PV system (CPV). However, the cost to develop such a plant as well as the visual and sense of place aspects the solar crystalline PV system primarily due to a reduction in the cost of PV when compared to CPV. In addition, the proponent's experience was that financiers were more comfortable with investing in the more established solar poly-crystalline PV system than in CPV. Refer to Table 1 – Comparison of Alternate Solar PV technologies.

Alternative 3 (Not Preferred Alternative) – Thin film PV Cells

The least preferred technology considered was thin film PV cells. It is least preferred due to all the reasons detailed in Table 1 below (Comparison of Alternate Solar PV technologies)

7.1.4. Layout Alternative:

The layout plan drawings attached in Appendix B indicate the placement of the infrastructural requirements and structures/buildings within the proposed development footprint. The initial determination of the proposed site locality accommodated buffers/setback areas from no-go regions such as the biodiversity no-go are to the south-west of project 1, or watercourses (wetlands and pans) on the sites.
The location of gates for access to the site uses existing roads and access points and therefore will not be a new development.

Placement of the battery storage bank/s is currently planned adjacent to each inverter-transformer station as positioned throughout the solar PV array (refer to Appendix B - Layout Plans). Due to the limited space availability, this appears to be the only practical configuration in terms of position/layout.

Due to the fact that the orientation of the panels is confined to be north facing for optimum energy harvesting, and the tight footprint or the proposed energy output of the proposed development, no alternative layout configuration exists

7.1.5. No-go Alternative:

The no-go alternative will not result in any removal of vegetation or impacts on biodiversity (flora or faunal) or loss of agricultural land since the development will not take place. In addition, the designated CBAs and ESAs will be able to function unhindered. However, this does not guarantee that the ecosystem will revive or thrive since the area is used for grazing and parts of the farm are quite degraded.
.
The no-go alternative will also result in South Africa's unsustainable, coal-based electricity supply will not be augmented with renewable energy alternatives.

Considering that this development is proposed to be part of the REIPPPP bidding process (Bid Window 5), Government's target of securing 17 800MW of renewable energy capacity by 2030, as well as the country's commitment to wider/global climate change issues will remain subordinate to other pressing challenges which our country faces.

Due to the nature of the activity, and the size and location of the site (located with an area specified by the Government for such developments), the socio-economic benefits of the activity for the wider national community are considered to greatly outweigh any environmental benefits of not implementing the activity.

The no-go alternative is, therefore, not advocated.

8. ASSESSMENT METHODOLOGY AND IMPACT ASSESSMENT

Please refer to Appendix I for details on proposed project impact assessment methodology, as well as significance rating and mitigation measures.

It should be noted that the mitigation measures for solar energy projects published in the then Department of Environmental Affairs' EIA Guideline for Renewable Energy Projects (2015), were considered and applied to the feasibility of the proposed Visserspan solar PV development as part of the initial pre-application phase.

As such, several mitigation measures have already been incorporated into the fundamental planning of the proposed development whilst other mitigation measures have been incorporated into the assessment report and EMPr to be implemented prior site clearance or construction or as an on-going process during construction and operation phases.

Mitigation measures as listed in the Departmental EIA Guidelines and already incorporated in the impact assessment report and specialist assessments, or to be included in the development at the appropriate phase are listed in Table below:

No.	Mitigation Measure	Implementation/Incorporation in Project
1	Conduct pre-disturbance surveys as appropriate to assess the presence of sensitive areas, fauna, flora and sensitive habitats	• Specialist site visits and surveys to assess viability of site for proposed development undertaken. • An additional ecological survey of the site prior to construction in terms of protected and/or endangered faunal and floral species must be undertaken to ensure that the relevant ecologist/biodiversity specialist (including flora, fauna and avifauna expertise) will be able to develop an adequate search and rescue plan, or a management plan in terms of alien plant species, if required.
2	Plan visual impact reduction measures such as natural (vegetation and	• Visual impact assessment indicated that the topography and landscape elements of the area displays a high absorption level.

	topography) and engineered (berms, fences, and shades, etc.) screens and buffers	• Large trees on boundary of sites to be retained wherever possible, to enable visual screening of the development from public roads/neighbouring properties.
3	Utilise existing roads and servitudes as much as possible to minimise project footprint	• All access road to the sites are existing roads (either public or internal farm roads).
4	Site projects to avoid construction too near pristine natural areas and communities	• Area in the south-west of the farm was determined to have biodiversity significance and identified as a 'no-go' area. The south western corner of the farm was, therefore, excluded from potential land to be considered for placement of Visserspan Solar PV Facility - Project 1's development footprint
5	Locate developments away from important habitat for faunal species, particularly species which are threatened or have restricted ranges, and are collision-prone or vulnerable to disturbance, displacement and/or habitat loss	• No wetland/pan areas identified on Project 1's site – other pans/wetlands on the Farm Visserspan excluded from any development site (with a setback/buffer of at least 100m). • Area contains endangered (A1) Vaal-Vet Sandy Grassland in an apparent CBA 1 area – botanical specialist's site visit to ground truth database information dispute the classification of areas as CBAs and ESAs on the farm Visserspan.
6	Fence sites as appropriate to ensure safe restricted access	• Fencing and access-controlled entrance accommodated in plans (visual simulation of impact of fencing also taken into account as per Visual Impact Assessment report attached as Appendix G3c).
7	Ensure dust abatement measures are in place during and post construction	• Dust control strategy/plan included in section 7.10.26 of EMPr
8	Develop and implement a storm water management plan	• Storm water management plan included as Appendix 21 of EMPr
9	Develop and implement waste management plan	• Waste management addressed in section 7.10.21 of EMPr
10	Re-vegetation with appropriate indigenous species to prevent dust and erosion, as well as establishment of alien species	Alien invasive management plan included in section 7.10.11 of the EMPr

Table 5: Summary of general mitigation measures implementation/incorporation

9. ENVIRONMENTAL ISSUES AND POTENTIAL IMPACTS

According to the independent Visual Impact Assessment attached as Appendix E1:

Actual and potential view receptors affected by this proposed development were identified. The impact of the proposed development on these receptors was evaluated and also considered the effect of the proposed development on the sense of place of the environment.

The site is located in a low structural density, rural area, and is currently the northern-most location for a solar PV plant in the Dealesville region. Several (at least 12) facilities have already been applied for and/or received approval between Dealesville and the proposed Visserspan Solar PV Facility - Project 1 development.

Due to the topography and landscape elements, the area displays a high absorption level. The assessment of the potential receptors indicated that the overall impact is low and well within acceptable levels of change.

While both the archaeological and palaeontological specialists had no objections to the proposed development being authorised (refer to Appendix G3a and G3b), using the precautionary principle, the possibility of any heritage related discovery during construction has been accommodated in the EMPr (attached as Appendix J), this is in line with the comment received from SAHRA in such cases. Final Comment on the Notice of Intent to develop (from SAHRA) is attached as Appendix E6 of this final BAR - Correspondence from Organs of State.

10. PUBLIC PARTICIPATION PROCESS

As per the NEMA 2014 regulations (as amended), a comprehensive public participation process is required to inform interested and affected parties (I&APs) of the proposed development and alternatives.

Particulars of the public participation process conducted and still to be conducted, are summarised below:

i. Pre-application public participation (PP) process:
Placed advertisement in local newspapers regarding project, availability of copies of documents and process to register as an I&AP.
Sent out notifications to Interested and Affected Parties (I&APs) previously registered for projects in the areas (Organs of State; Forums; Community groups, etc.)
Placed A2 posters on site

Displayed and placed A3 posters, maildrop letters/background information document in public facilities (Municipality and large retail shops)
Displayed A3 posters at local public amenities (local clinic / bar)
Delivered maildrop letters to neighbouring properties / farms spaza shops
Made copies of PP associated documents available on EnviroAfrica website for public viewing / comment
Emailed, delivered or posted copies of any PP documentation to querying I&APs who requested them.
Compiled comments and response trail report as per Appendix F.
Updated I&AP List.

ii. Post-application PP process:
PP involving informing via email, posting of cd copies process for all registered I&APs for the post-application round of PP using DBAR.

iii. Inform all registered I&APs of submission of final BAR as the third round of PP and availability on website using.
Await DEFF EA decision.

iv. Inform I&APs within 14 days of DEFF decision when received.

11. CONCLUSIONS

According to the BGIS maps in Appendix D, the site does fall within CBA or ESAs and is located within a rural area (property is zoned 'Agricultural'). The botanical specialists' opinion after ground-truthing the BGIS maps differs with the CBA and ESA classification. Although the DEFF Screening Tool attached as Appendix H indicates that the area is of high animal species/biodiversity significance, it is evident that the proposed development site is or was transformed / disturbed land which was used for grazing and although is currently being rested, would revert to a degraded to semi-degraded state if surrounding areas on the Farm Visserspan which are subject to cattle grazing, is used as a guage.

From desktop studies, it seems that no endangered or threatened faunal species seem to be prevalent in the proposed development site. Nonetheless, the EMPr will require a search

and rescue of any faunal and flora species as required by the environmental control officer or regulating authority during construction, should it be deemed necessary e.g. such as for tortoises and toads.

The land surrounding the proposed development site comprises a mix of land uses: agricultural land, Eskom high voltage power line servitudes, Perseus substation, farm workshops and scattered residences and further afield (not immediate neighbour/s) game farms.

According to the independent Visual Impact Assessment report (attached as Appendix G3c): The undulating landscape and the low vertical extent of the planned infrastructure results in a low overall visual impact.

The small extent of the project in relation to the number of approved PV facilities as well as the fact that the site abuts the approved projects and is in close proximity to the Perseus substation, results in a low contribution to the cumulative impact with regards to crowding. Due to the low overall visual impact, no mitigation measures are required.

Refer to Appendix A5 (Visserspan Farm Cumulative Map Projects 1-4) which indicates the potential layout on a local scale should all the Visserspan Projects be developed.

Refer to Appendix A6 (Cumulative REDZ 5 Projects Maps) which indicates the30km radius from the study site relative to other renewable development applications, as well as the entire REDZ 5 region. It is evident that the proposed Visserspan development consolidates with other power producing facilities relatively close to Perseus substation.

12. RECOMMENDATIONS

All recommendations made in specialist reports and the EMPr (and the environmental authorisation, should it be granted) must be adhered to as detailed in this BAR and in Appendix J (EMPr) attached.

Biodiversity:

There are numerous possibilities for mitigation measures to lessen the direct impact during construction and even operation. The construction areas must be clearly demarcated and must aim for the absolute minimum disturbance footprint.

- An ecological survey of the site prior to construction in terms of protected and/or endangered faunal and floral species must be undertaken to ensure that the relevant ecologist/biodiversity specialist (including flora, fauna and avifauna expertise) will be able to develop an adequate search and rescue plan, or a management plan in terms of alien plant species, if required.
- All construction must be done in accordance with an approved construction and operational phase Environmental Management Plan (EMP), which must be developed by a suitably experienced Environmental Assessment Practitioner.
- A suitably qualified Environmental Control Officer must be appointed to monitor the construction phase in terms of the EMP and the Biodiversity study recommendations as well as any other conditions pertaining to other specialist studies and requirements of the DESTEA, DAFF or DEFF.
- **Permits must be obtained in terms of the NFA, NEMBA and CARA** for the removal of any protected species, should any be found on site, or for the demarcation and/or management and control of any alien invasive species, as may be required .
- Before any work is done the footprint must be clearly demarcated. The demarcation must aim at minimum footprint and minimisation of disturbance.
- Topsoil (the top 15-20 cm) must be removed and protected and re-used for rehabilitation purposes of suitable areas on site or within the immediate surroundings (Seedbed protection).
- In the pre-construction survey of flora on site, the footprint must be scanned by a botanist or suitably qualified ECO in order to identify the plants listed for Search & Rescue. The Botanist must advise on the best way for search & rescue and must also take the following into account:
    - These plants should be used for rehabilitation/re-vegetation and should not be transplanted in an area where they will be easily disturbed. They should be planted with the site same vegetation type if possible and could be used to prevent dust and erosion as well as the establishment of alien species.
    - An initial watering program must be implemented for transplanted plants until they are established.

- All efforts must be made to protect all mature indigenous trees that might be encountered.
- Lay-down areas or construction camp sites must be located within areas already disturbed or areas of low ecological value and must be pre-approved by the ECO.
- Indiscriminate clearing of any area outside of these footprints may not be allowed.
- Alien invasive plant species must be removed from within the construction footprint (including laydown areas etc.). Follow up work must be carried out throughout the construction phase to ensure that no invasive alien plant re-establishes itself.
- All construction areas must be suitably rehabilitated on completion of the project.
    - This includes the removal of all excavated material, spoil and rocks, all construction related material and all waste material.
    - It also includes replacing the topsoil back on top of the excavation as well as shaping the area to represent the original shape of the environment.
    - All absolute aboveground infrastructure associated with the site must be removed.

- An integrated waste management approach must be implemented during construction.
    - Construction related general and hazardous waste may only be disposed of at Municipal approved waste disposal sites.
    - Clean spoil from excavation work must be used as fill where possible.
    - All rubble and rubbish must be collected and removed from the site to a Municipal approved waste disposal site.

<u>Heritage</u>

In the event that indicator(s) of heritage resources are identified, the following actions must be taken immediately:

- All construction within a radius of at least 20m of the indicator must cease. This distance should be increased at the discretion of supervisory staff if heavy machinery or explosives could cause further disturbance to the suspected heritage resource.
- This area must be marked using clearly visible means, such as barrier tape, and all personnel must be informed that it is a no-go area.
- A guard should be appointed to enforce this no-go area if there is any possibility that it could be violated, whether intentionally or inadvertently, by construction staff or members of the public.

- Should any evidence of archaeological or palaeontological sites or remains (e.g. unmarked human burials/remains, ostrich eggshell fragments/water flask caches, remnants of stone-made structures, indigenous ceramics or charcoal and ash concentrations) be uncovered or exposed during construction activities, these must immediately be reported to the archaeologist (Jonathan Kaplan 082 321 0172), or the South African Heritage Resources Agency Archaeology, Palaeontology and Meteorites (SAHRA APM) Unit (Natasha Higgitt/John Gribble 021 462 5402).
- Should fossil remains such as bones, teeth, shells or petrified wood be discovered before or during the construction phase, these should be safeguarded (preferably *in situ*) and the ECO should alert the South African Heritage Resources Agency, SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Phone: +27 (0)21 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za). This is so that appropriate mitigation (*e.g.* recording, sampling or collection) can be taken by a professional palaeontologist (See tabulated Chance Fossil Finds Procedure appended to this report). The specialist involved would require a collection permit from SAHRA. Fossil material must be curated in an approved repository (*e.g.* museum or university collection) and all fieldwork and reports should meet the minimum standards for palaeontological impact studies developed by SAHRA (2013).
- If unmarked human burials are uncovered the SAHRA Burial Grounds and Graves Unit (Mimi Seetelo 021 320 8490) must immediately be alerted. Burials must not be removed or disturbed until inspected by the archaeologist and SAHRA BGG Unit.
- No measures must be taken to cover up the suspected heritage resource with soil, or to collect any remains such as bone, ceramics or stone.
- The South African Police Services must be notified by a SAHRA staff member or an independent heritage practitioner if human remains are identified. No SAPS official may disturb or exhume such remains, whether of recent origin or not.
- All parties concerned must respect the potentially sensitive and confidential nature of the heritage resources, particularly human remains, and refrain from making public statements until a mutually agreed time.

Soil Capability and Agricultural Potential

It was concluded by the specialist that “the proposed development of a photovoltaic facility on the site will not have large impacts due to the low agricultural potential of the site as well as the rainfall that is below 500 mm pa.

Even though the soils on the site are not considered to be highly sensitive to erosion such prevention measures should be put in place due to the general slope of the site. The main impacts that have to be managed on the site during the construction activities are:

1. Erosion must be controlled through adequate mitigation and control structures.
2. Impacts from vehicles, such as spillages of oil and hydrocarbons, should be prevented and mitigated.
3. Dust generation on site should be mitigated and minimised as the dust can negatively affect the quality of grazing as well as livestock production.

All recommendations made in specialist reports and the EMPr (and the environmental authorisation, should it be granted) must be adhered to, in particular, but not limited to, ECO site compliance inspections/audits and reporting, during and post construction (detailed in section.

The above recommendations must be included in the Environmental Management Plan (EMP) for the proposed development.

It is proposed that the authorisation be valid for a period of 25 years with construction commencing within 5 years from the date of authorisation, should authorisation be granted.

It is, therefore, recommended that this application be authorised with the necessary conditions of approval as described throughout this BAR and associated EMPr.

13. APPENDICES

APPENDIX		TITLE	APPENDIX ATTACHED? YES
A		Maps	✓
	A1	Locality	✓
	A2	Project Site Coordinates	✓
	A3	Status Quo	✓
	A4	Regional	✓
	A5	Visserspan Farm Projects 1-4 Cumulative	✓
	A6	REDZ 5 and Cumulative Renewable Energy EIA Applications	✓
	A7	Project Layout Superimposed on Sensitivity Layers	✓
B		Layout Plans	✓
	B1	Site Layout Plans	✓
	B2	Visserspan Farm Cumulative Layout Plans	✓
	B3	Typical O&M Building Plans	✓
	B4	Typical Ablutions and Septic Tank Plans	✓
	B5	Typical Electrical Trenching and Internal Roads Plans	✓
C		Site Photographs	✓
D		Biodiversity/Sensitivity Maps	✓
E		Correspondence with Organs of State/National Partner Entities	✓
	E1	DEFF	✓
	E2	DEFF (Biodiversity Directorate)	✓
	E3	DAFF	✓
	E4	DAFF (Provincial)	✓
	E5	DHSW&S (Provincial)	✓
	E6	SAHRA	✓
	E7	Municipality	✓
	E8	Eskom	✓
	E9	CAA	✓
	E10	SKA	✓

	E11	SANRAL	✓
	E12	BirdLife South Africa	✓
	E13	DMR&E	✓
	E14	SANDF	✓
	E15	NERSA	✓
	E16	Department of Transport	✓
	E17	DESTEA (Provincial)	✓
F		Comment and Response Report/s	✓
	F1	Supporting Documents	✓
	F2	Public Participation Proof	✓
	F3	Interested and Affected Parties (I&AP) Lists	✓
G		Specialist Studies/Opinions	✓
	G1	Botanical Impact Assessment	✓
	G2	Freshwater Impact Assessment	✓
	G3	Heritage Impact Assessment	✓
	G3a	Archaeological Impact Assessment	✓
	G3b	Palaeontological Impact Assessment	✓
	G3c	Visual Impact Assessment	✓
	G4	Soil, Land Use and Agricultural Potential Survey	✓
	G5	Socio-economic Report	✓
	G6	Specialist Letters	✓
	G6a	Botanical Specialist *re.* DEFF Biodiversity Comments	✓
	G6b	Geo-spatial Specialist *re.* Slope of Property	✓
H		Screening Tool Report	✓
I		Impact Assessment	✓
J		Environmental Management Programme/Plan (EMPr)	✓
K		Property Owner's Consent and Property Title Deed	✓
L		Specialists' Declarations	✓
M		EAP's Declaration, Undertaking and CV	✓
N		Applicant's Declaration	✓