ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAr)

in terms of the Environmental Impact Assessment Regulations, 2014, promulgated in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended.

File Reference Number:

14/12/16/3/3/2/998

Project Title:

Proposed Development of a 225MWac Solar PV Plant on Several Portions of Farms in the Hanover District, Emthanieni Local Municiplaity, Pixley Ka Seme District Municipality, Northern Cape.

Prepared for

Jean-Paul de Villiers (Managing Director)
Soventix South Africa
Unit C-24/25
Olive Grove Industrial Estate
Ou Paardevlei Road
Somerset West
South Africa

Tel: +27 (0)21 852 7333
Fax: +27 (0)21 852 5089
Email: jp.devilliers@soventix.com

Compiled by

Ecoleges Environmental Consultants
P.O. Box 9005
Nelspruit
1200

Cell: +27 (0)82 451 5608
Fax: +27 (0)86 697 9316
Email: justin@ecoleges.co.za

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(Final Report for Decision)

DOCUMENT CONTROL

Table 1: Document Control

COMPILED/REVISED BY	STATUS	REVISION	REVIEWED/ APPROVED BY	DISTRIBUTED ON
Philip Radford	Draft	00	Shaun MacGregor	08/08/2017
Philip Radford	Final draft	00	Shaun MacGregor	07/11/2017

Table 2: General Site Information

The following general site information is required:	
Descriptions of all affected farm portions;	
Appendix H (iv)	
21-digit Surveyor General codes of all affected farm portions;	
The 21-digit Surveyor General Codes of each cadastral land parcel are as follows: • Remainder of Farm Goedehoop 26C C03000000000002600000 • Portion 6 of Leuwe Fountain 27C C03000000000002700006 • Remainder of Farm Riet Fountain 39C C03000000000003900000 • Portion 1 of Farm Riet Fountain 39C C03000000000003900001 • Remainder of Kwanselaars Hoek 40C C03000000000004000000 • Portion 1 of Kwanselaars Hoek 40C C03000000000004000001 • Portion 4 of Taaibosch Fontein 41C C03000000000004100004 • Portion 1 of Farm Kafferspoort 56C C03000000000005600001	
Copies of deeds of all affected farm portions;	
Appendix A: Annexure D	
Photos of areas that give a visual perspective of all parts of the site;	
Appendix B: Annexure A	
Photographs from sensitive visual receptors (tourism routes, tourism facilities, etc.)	
Appendix B: Annexure B	
PV plant design specifications including:	
Type of technology	Solar PV Plant of PV panels using polycrystalline solar module technology
Structure height	2.5m
Surface area to be covered (including associated infrastructure such as roads)	448ha
Surface orientation	Northern direction
Laydown area dimensions (construction period and thereafter)	Figure 2
Generation capacity	225MWac
Generation capacity of the facility as a whole at delivery points.	225MWac, less intrinsic losses.

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Checklist: Content of EIA Report in terms of Appendix 3 of the EIA Regulations, 2014

(1) ***"An environmental impact assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include- "***		
(a) details of-	YES	NO
(i) the EAP who prepared the report; and	**x**	
(ii) the expertise of the EAP, including a curriculum vitae;	**x**	
(b) the location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including:		
(i) the 21-digit Surveyor General code of each cadastral land parcel;	**x**	
(ii) where available, the physical address and farm name;	**x**	
(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	**N/A**	
(c) a plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it		
(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or	**N/A**	
(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	**N/A**	
(d) a description of the scope of the proposed activity, including-		
(i) all listed and specified activities triggered;	**x**	
(ii) a description of the associated structures and infrastructure related to the development;	**x**	
(e) a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	**x**	
(f) a motivation for the need and desirability for the preferred development footprint within the approved site as contemplated in the accepted scoping report;	**x**	
(g) a motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;		
(h) a full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report; including;	**x**	
(i) details of all the development footprint alternatives considered;	**x**	
(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	**x**	
(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	**x**	
(iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social,	**x**	

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economic, heritage and cultural aspects;		
(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;	**x**	
(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;	**x**	
(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community, that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	**x**	
(viii) the possible mitigation measures that could be applied and level of residual risk;	**x**	
(ix) if no alternatives development **[locations]** footprints for the activity were investigated, the motivation for not considering such and	**N/A**	
(x) a concluding statement indicating the location of the preferred alternative development **[locations]** footprint within the approved site as contemplated in the accepted scoping report;	**x**	
(i) full description of the process undertaken to identify, assess and rank the impacts, the activity and associated structures and infrastructure will impose on the preferred [location] development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including;	**x**	
(i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and	**x**	
(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	**x**	
(j) an assessment of each identified potentially significant impact and risk, including-		
(i) cumulative impacts;	**x**	
(ii) the nature, significance and consequences of the impact and risk;	**x**	
(iii) the extent and duration of the impact and risk;	**x**	
(iv) the probability of the impact and risk occurring;	**x**	
(v) the degree to which the impact and risk can be reversed;	**x**	
(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and	**x**	
(vii) the degree to which the impact and risk can be mitigated;	**x**	
(k) where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	**x**	
(l) an environmental impact statement which contains-		
(i) a summary of the key findings of the environmental impact assessment:	**x**	

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(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred **[site]** development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and	**x**	
(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	**x**	
(m) based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the [impact management outcomes and the] development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	**x**	
(n) the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	**x**	
(o) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation	**x**	
(p) a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	**x**	
(q) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	**x**	
(r) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded, and the post construction monitoring requirements finalised;	**x**	
(s) an undertaking under oath or affirmation by the EAP in relation to:		
(i) the correctness of the information provided in the reports;	**x**	
(ii) the inclusion of comments and inputs from stakeholders and I & APs;	**x**	
(iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and	**x**	
(iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	**x**	
(t) where applicable, details of any financial provision[s] for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	**x**	
(u) an indication of any deviation from the approved scoping report, including the plan of study, including-	**x**	
(i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and	**x**	
(ii) a motivation for the deviation;	**x**	
(v) any specific information that may be required by the competent authority; and	**x**	
(w) any other matter required in terms of section 24(4)(a) and (b) of the Act.	**N/A**	

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EXECTIVE SUMMARY

The project proponent, Soventix South Africa have appointed Ecoleges Environmental Consultants as the Environmental Assessment Practitioner (EAP) to undertake an application for Environmental Authorisation (EA). The proposed Solar Photovoltaic (PV) Plant in the Northern Cape will trigger listed activities within the EIA Regulations (2014) and the application dated 18th November 2016 and supporting reports will be submitted to the National Department of Environmental Affairs (DEA) as the designated Competent Authority.

The proposed activity entails solar panels arranged in blocks with a total generating capacity of approximately 225MWac to be constructed as three separate yet integrated facilities of 75MWac each. A footprint of approximately 187 hectares (ha) is required per 75MWac facility, totalling approximately 448ha; each 75MWac facility will have an operations building to be contained within a 30 000 m² lay down area. The facility will include areas used for security management, control room, maintenance store rooms, offices and changing facilities. An on-site substation will be required with the necessary infrastructure to feed the electricity generated, via a loop in loop out, into the adjacent 132kv or 400kv Eskom network.

The project location is on several Portions of Farms in the Hanover District, Emthanieni Local Municipality, Pixley Ka Seme District Municipality, Northern Cape. Several potential locations were considered, but 3 alternative development footprints were investigated within the approved site in consultation with the EAP, Client and Landowner.

Photovoltaic (PV) is a method of generating electrical power by converting solar radiation into direct current electricity. A number of solar cells electrically connected to each other and mounted in a support structure or frame is called a photovoltaic module (solar panel).

The purpose of the new Solar PV system, includes the establishment of De Aar as a Renewable Energy Hub, which can be achieved by providing different renewable energy options. The aforesaid Hub has to be within close proximity to existing Eskom infrastructure. Locally, the establishment of the proposed project would strengthen the existing electricity grid for the area, providing power in a short space of time (potentially less than two years to commissioning). Should the proposed project be approved it would result in long-term benefits for the De Aar area, e.g. creation of employment and business opportunities.

This EIA forms part of the feasibility study and prerequisite by National Energy Regulator of South Africa (NERSA) for awarding a Power Purchase Agreement (PPA) under the Renewable Energy Feed in-Tariff (REFIT) program. The REFIT program requires the applicant to have all required authorisations in place before submitting a project proposal for the next scheduled phase which includes Solar PV as an option. The requirement for the successful establishment of a Solar PV plant does include, inter alia, proximity to existing Eskom infrastructure to feed electricity into the grid.

The NEMA prescribes that all Environmental Impact Assessments, which are to be utilised in informing an application for environmental authorisation, must identify and investigate the alternatives to the

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activity on the environment, and include a description and comparative assessment of the advantages and disadvantages that the proposed activity and feasible and reasonable alternatives will have on the environment and on the community, that may be affected by the activity. The Environmental Scoping process identified the potential positive and negative environmental (biophysical and social) impacts associated with the proposed establishment of a Solar PV Plant and associated infrastructure. Many issues for consideration were identified by the EAP and appointed Specialists during the scoping process. These environmental aspects have been assessed in more detail during the environmental impact process for the alternative development footprints within the preferred site.

The general objectives of public participation will be undertaken to provide the registered interested and affected parties the opportunity to comment at different stages of the EIA process including a public meeting and receipt of project information and associated statutory reports. The comments and responses will be recorded and form part of the final Environmental Impact Assessment Report (EIR).

To narrow down the preferred alternative, all the specialists GIS shapefile information has been overlaid, combining all the sensitive information into a consolidated “no-go” area map. The next step was to alter the development footprint alternatives to avoid these sensitive areas and identified no go areas. These redefined and moved footprints into less sensitive areas and avoiding the Critical Biodiversity area (CBA), wetlands and rocky ridges.

In summary, following the combination of the development footprint selection matrix exercise, impact assessment and cumulative impact assessment using the specialist findings, Interested and affected parties’ comments and the EAP judgement, has provided the motivation for PV02. As this preferred alternative development footprint had the least negative weighting score when compared to alternatives 01 & 03 for geographical, physical, biological, social, economic, heritage and cultural aspects.

The establishment of the proposed project would strengthen the country’s move towards renewable energies and reduce the over reliance on fossil fuels. Should the proposed project be approved it would result in long-term benefits for the De Aar area, e.g. creation of employment and business opportunities.

In consideration of the investigated cumulative impacts, the nature and extent of the proposed development, compliance with the relevant legal, policy and planning documentation (i.e. “need and desirability”) and the findings of the specialist studies, it is the opinion of Ecoleges that the proposed Soventix Solar PV Plant development is supported from an environmental perspective and should be considered for Environmental Authorisation, subject to the implementation of the identified recommendations.

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ABBREVIATIONS AND DEFINITIONS

Table 3: List of terms for abbreviations and acronyms used in this document.

Abbreviation	Term
AC	Alternating Current
CA	Competent Authority
DC	Direct Current
DEA	Department of Environmental Affairs (National)
DMR	Department of Mineral Resources
DENC	Department of Environment and Nature Conservation (Northern Cape)
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EIAr	Environmental Impact Assessment Report
EMPr	Environmental Management Programme
ELM	Emthanjeni Local Municipality
ELU	Existing Lawful Use
GA	General Authorisation
GWh	Gigawatt hours
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IRP	Integrated Resource Planning
LA	Listed Activity (EIA Regulations, 2014)
LN1	Listing Notice 1: GN R. 983, 4 December 2014
LN2	Listing Notice 2: GN R. 984, 4 December 2014
LN3	Listing Notice 3: GN R. 985, 4 December 2014
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
MVA	Mega Volt Amp
MW	Megawatt
MWac	Megawatt Alternating Current
MTS	Main Transmission Station
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)

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NWA	National Water Act, 1998 (Act No. 36 of 1998)
PDM	Pixley ka Seme District Municipality
PPA	Power Purchase Agreement
REFIT	Renewable Energy Feed-in Tarrif
SAHRA	South African Heritage Resources Agency
SDF	Spatial Development Framework
WUL	Water Use License

Table 4: Definitions of some terms used in this document.

Term	Source	Definition
Environmental Impact	ISO 14001: 2004	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from those elements of the proposed activities that can interact with the environment.
Scope	ISO 14001:2004	Refers to the extent and boundaries of the EMPr including geographical location, a timeframe, organisational units and activities.
Aspect	ISO 14001:2004	Element of an organization's activities or products or services that can interact with the environment.
Impacts	ISO 14001:2004	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects.

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SECTION A: DETAILS OF THE EAP AND APPLICANT

Details of –
(i) The EAP who prepared the report; and
(ii) The expertise of the EAP, including a curriculum vitae;

Environmental Assessment Practitioner	Ecoleges Environmental Consultants
Contact Person	Justin Aragon Bowers
Postal Address	PO Box 9005, Nelspruit, 1200
Telephone	+27(0)83 644 7179
E-mail	justin@ecoleges.co.za

Project Applicant	Soventix South Africa (Pty) Ltd
Trading Name (if any)	Soventix South Africa
Contact Person	Jean-Paul de Villiers
Physical Address	Unit C-24/25 Olive Grove Industrial Estate Ou Paardevlei Road Somerset West South Africa
Postal Address	As above
Postal Code	7130
Telephone	+27(0)21 852 7333
Cell	+27(0)82 550 6672
Fax	+27(0)21 852 5089
Email	Jp.devilliers@soventix.com

Abbreviated Curriculum Vitae of Justin Aragorn Bowers

Justin Aragorn Bowers

Name	Justin Bowers
Date of birth / ID No.	15 October 1972 7210155074089
Nationality	South African
Marital Status	Married with four children
Current Address	P O Box 516, Machadodorp, 1170. ● Redwing Farm, erf. Kaalbooi 368JT, Waterval Boven District, 1195, Mpumalanga, South Africa ● Cell: 082 451-5608 ● e-mail: justin@ecoleges.co.za
Languages	English, Afrikaans and Basic Zulu
Driver's Licence	Code EB, A & C1
Specialisations	Key Fields: Compliance monitoring, vegetation ecology, rehabilitation plans, environmental/ecological management plans, environmental auditing, Environmental Impact & Basic Assessment.
Qualifications & Courses Attended	**1998 – 2000** NATIONAL DIPLOMA: NATURE CONSERVATION, Technikon Pretoria **2001 – 2002** BACCALAUREUS TECHNOLOGIAE: NATURE CONSERVATION, Technikon Pretoria **2003 – 2007** MAGISTER TECHNOLOGIAE: NATURE CONSERVATION (CUM LAUDE), Tshwane University of Technology, Pretoria **1999 – 2000** Level 1 & 2 Qualifications, Field Guides Association of Southern Africa **2008** Environmental Law elective (MBA Programme), Rhodes University, Grahamstown. **2010 – Present** Certificate in Aquaculture, Department of Genetics & Aquaculture, University of Stellenbosch **2014** Implementing Environmental Management Systems, Centre for Environmental Management, North-West University, Potchefstroom.
Latest Publication	Sadie J. Ryan, Paul C. Cross, John Winnie, Craig Hay, Justin Bowers, Wayne M. Getz. 2012. The utility of normalized difference vegetation index for predicting African buffalo forage quality. *Journal of Wildlife Management* DOI: 10.1002/jwmg.407.
Countries worked	South Africa, United Kingdom.

Career Summary	**Jan 1995 – Jul 1997** Head Ranger (Idube Lodge, Sabi-Sands Wildtuin). **Dec 2000 – Dec 2001** Research student, Scientific Services, KNP. **Jan 2001 – Mar 2006** Senior Research Assistant, Mammal Research Institute, University of Pretoria. **Apr 2006 – current** Main Member, Ecoleges Environmental Consultants.

Full Curriculum Vitae available if required

SECTION B: THE LOCATION OF THE DEVELOPMENT FOOTPRINT OF THE ACTIVITY ON THE APPROVED SITE AS CONTEMPLATED IN THE ACCEPTED SCOPING REPORT:

Including –

(i) The 21-digit Surveyor General code of each cadastral land parcel;

(ii) where available, the physical address and farm name;

(iii) where the required information in terms (i) and (ii) is not available, the coordinates of the boundary of the property or properties;

The 21-digit Surveyor General Codes of each cadastral land parcel are as follows:

- Remainder of Farm Goedehoop 26C C03000000000002600000
- Portion 6 of Leuwe Fountain 27C C03000000000002700006
- Remainder of Farm Riet Fountain 39C C03000000000003900000
- Portion 1 of Farm Riet Fountain 39C C03000000000003900001
- Remainder of Kwanselaars Hoek 40C C03000000000004000000
- Portion 1 of Kwanselaars Hoek 40C C03000000000004000001
- Portion 4 of Taaibosch Fontein 41C C03000000000004100004
- Portion 1 of Farm Kafferspoort 56C C03000000000005600001

Please refer to the following Appendices for more details:

- **Appendix A**: SITE MAPS
- *Annexure H*: Copy of Deeds for Affected Properties; and
- *Annexure I*: Preferred Alternative Footprint Boundary Points.

The footprint of the preferred alternative, if accepted by the DEA, will only affect 3 of the 8 properties and portions listed above namely; Portion 1 of Farm Riet Fountain 39C, Portion 1 of Kwanselaars Hoek 40 C & Portion 4 of Taaibosch Fontein 41C.

SECTION C: LOCATION PLAN OF THE PROPOSED ACTIVITY

At an appropriate scale, or if it is –

(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities to be undertaken; or

(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;

Please refer to the following Appendices for more details:

- **Appendix A**: SITE MAPS;
- **Appendix B**: SITE PHOTOGRAPHS

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SECTION D: DESCRIPTION OF THE SCOPE OF THE PROPOSED ACTIVITY

Including -

(i) all listed and specified activities triggered and being applied for; and

(ii) a description of the associated structures and infrastructure related to the development;

National Environmental Management Act, 1998

The proponent of the proposed development must comply with the provisions and regulations published in Government Notice No. R. 982, R. 983, R. 984, and R. 985 in Government Gazette No. 38282 of 04 December 2014, promulgated in terms of sections 24(5), 24M and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) regarding control over listed activities which may have a detrimental effect on the environment. Five listed activities are triggered by the proposed development of a 225 MWAC Solar PV Plant and associated infrastructure for the transmission and distribution of electricity, including potential impacts within a watercourse, more than 1ha of indigenous vegetation and land used for agriculture (**Table 5**).

Table 5: Potential listed activities triggered in respect of the proposed project.

Activity and Notice No.	Listed Activity	Motivation including a Description of the Activity
19 GN No. R 983, 2014, as amended (GN No. R. 325, 2017).	The infilling or depositing of any material of more than **[5]** 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than **[5]** 10 cubic metres from **[-(i)]** a watercourse; **[(ii) the seashore; or** **(iii) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater-]** but excluding where such infilling, depositing, dredging, excavation, removal or moving- (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; **[or]** (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies. (d) occurs within existing ports or harbours that will not increase the development	The current overhead ESKOM transmission lines that the Solar PV plant will feed into, run within an expansive drainage system, requiring limited work within this system to enable the loop-in, loop-out overhead transmission lines, founded in concrete footings within the watercourse.

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	footprint of the port or harbour; or (e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.	
27, GN No. R 983, 2014, as amended (GNR 325, 2017).	"The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for- (i) The undertaking of a linear activity; or Maintenance purposes undertaken in accordance with a maintenance management plan.	Vehicle service tracks will be created between the panel arrays as well as around the perimeter of the facility on the inside of the fence, that will require limited vegetation removal. Cleared footprints will also be required for the sub-station and powerline footings, all of which will collectively exceed 1 hectare.
28, GN No. R 983, 2014, as amended (GNR 325, 2017. GNR 983, 2014)	"Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development: (i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare; excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes".	The land use is currently agriculture, and will retain in part its agricultural use for livestock grazing, but will convert significant sections for commercial Solar PV for a fixed-term.
1, GN No. R 984, 2014, as amended by GNR 325, 2017,	"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs within= (a) within an urban area; or (b) on existing infrastructure.	The solar PV installation will be 225MW installed in three connected and integrated modules of 75MWac.
9, GN No. R 984, 2014, as	The development of facilities or infrastructure for the transmission and distribution of electricity with a capacity of	One set of overhead ESKOM lines are 400kv and the tie-in from the sub-station to the ESKOM overhead lines will thus

amended (GNR 325, 2017. GNR 984, 2014).	275 kilovolts or more, outside an urban area or industrial complex excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is — (a) temporarily required to allow for maintenance of existing infrastructure; (b) 2 kilometres or shorter in length; (c) within an existing transmission line servitude; and (d) will be removed within 18 months of the commencement of development.	need to be 400kv. ESKOM determines which of the overhead lines the project will feed into, one of which is more than 2km away from the proposed position of the sub-station.

Detailed Description of the Scope of the Proposed Activity

The proposed activity entails solar panels arranged in blocks with a total generating capacity of approximately 225MWac to be constructed as three separate yet integrated facilities of 75MWac each. A footprint of approximately 187 ha is required per 75MWac facility, totalling approximately 448ha; each 75MWac facility will have an operations building to be contained within a 30 000 m² lay down area for each facility. The facility will include areas used for security management, control room, maintenance store rooms, offices and changing facilities. An on-site substation will be required with the necessary infrastructure to feed the electricity generated, via a loop in loop out, into the adjacent 132kv or 400kv Eskom network. Existing roads will be used for main access, which may need to be enlarged to allow large equipment to access the site during construction.

The EAP, in collaboration with the Client and Landowner, identified 3 alternative development footprints within the approved site.

Alternative development footprints were assessed to determine or identify the preferred footprint that will have the least negative and/or most beneficial environmental impacts relative to the alternatives, and ensure that unacceptable site-specific impacts are avoided on the footprint proposed for development.

Photovoltaic Renewable Energy

Photovoltaic (PV) is a method of generating electrical power by converting solar radiation into direct current electricity. This is done by using semiconductors that exhibit the photovoltaic effect. Photovoltaic power generation employs solar panels composed of a number of solar cells containing a photovoltaic material. These materials exhibit this property known as the photoelectric effect that causes them to absorb photons of light and release electrons. When these free electrons are captured, an electric current result that can be used as electricity.

A number of solar cells electrically connected to each other and mounted in a support structure or frame is called a photovoltaic module (solar panel). Multiple modules can be wired together to form an

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array. In general, the larger the area of a module or array, the more electricity that will be produced. Photovoltaic modules and arrays produce Direct Current (DC) electricity. They can be connected in both series and parallel electrical arrangements to produce any required voltage and current combination.

Solar Panels

Each facility is proposed to include an array of PV panels using polycrystalline solar module technology and associated infrastructure. Each 75 MWAC solar PV facility is made of 1.25 MWAC blocks. Each block is approximately 2.5ha and comprises multiple arrays, that is rows of connected PV modules (solar panels) mounted onto a rack frame (**Figure 1**). The arrays are arranged parallel to one another, approximately 7.4m apart with a converter unit and supported by associated infrastructure, both permanent and temporary. Each converter has its own step-up transformer. These transformers will be fed to a point of connection consisting of switchgear and protection infrastructure.

Solar arrays would be orientated in a northern direction, offset at a maximum of 15 degrees either to the east or west and would have a maximum height of approximately 2.5 to 3 m (technology dependent) above ground level. The racks would have either a ballasted or piled foundation, which will be determined once the geotechnical survey has been completed. The use of a tracker system is also being considered. A tracker system could increase the performance of modules during early morning and late afternoon periods.

Modules would be tilted at a 30'degree angle, with each 75MWac footprint covering a total area of 187 ha (including rack frame, access roads etc.). Solar arrays would be placed over the vegetation, where possible. However, vegetation over 60 cm in height beneath the modules would need to be removed or cropped. In addition, vegetation within the proposed footprint of rack foundations, access roads, pylons and the internal underground cables (some of which are in the road verges) would also have to be partially removed. The proposed 225MVac PV Solar Plant layout plan is shown in **Figure 2** below.

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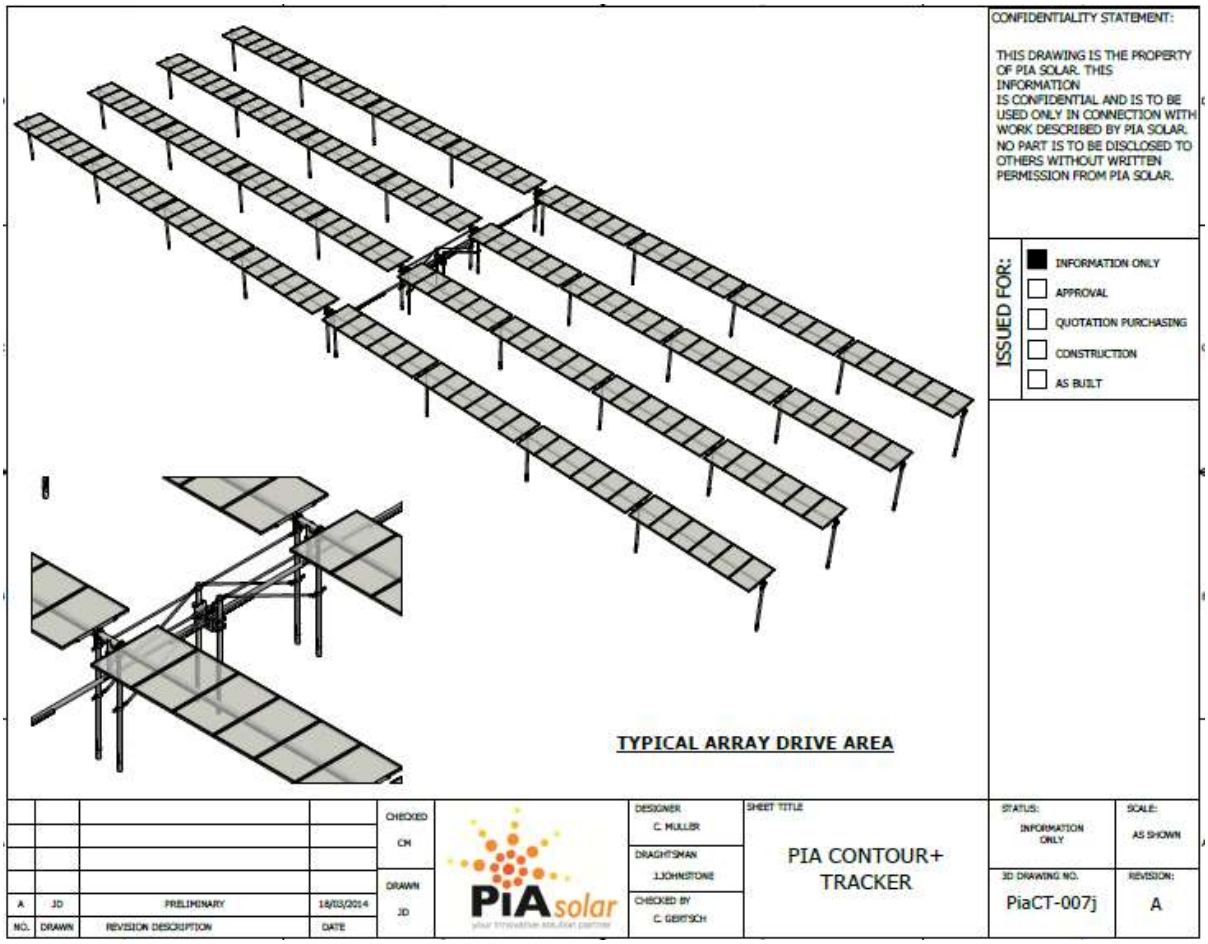

Figure 1: Illustration of the array layout and spacing (PiA solar, 2014).

Although the final layout is primarily determined by the technology choice and detailed design considerations. The final layout has been informed by the recommendations made in the specialist assessment studies that were undertaken and have been applied in the EIA phase.

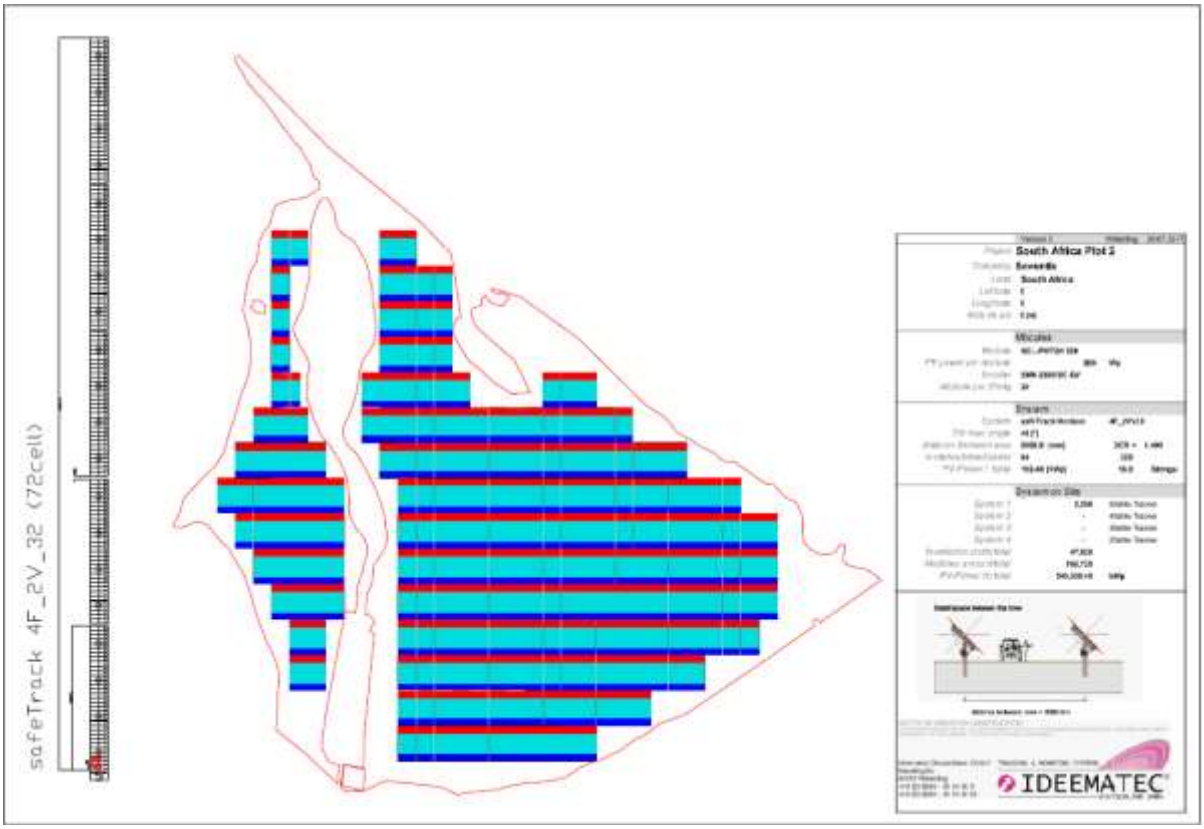

Figure 2: The 225MW Solar PV Plant layout plan (safe Track South Africa, 2017).

Project phases

Construction Phase

The estimated construction period for the integrated solar farm is 12 months. During this period approximately 300 people would work on site. A large number of the workforce would be sourced from the local labour force in and around De Aar and Hanover. The appointed contractor would be required to establish a construction camp and laydown area. It is anticipated that an area of approximately 1.5 ha per phase would be required for these purposes.

Table 6. Preliminary work force for construction phase.

Job description	Anticipated level of Education and/or skill	Actual number of employees	Duration of employment	Total Person Months Committed
Project management	Skilled	2	12 Months	51
Construction Management	Skilled	4	12 Months	84
Project Support	Skilled	2	12 Months	57
Logistic	Skilled	3	12 Months	83
HR	Skilled	2	12 Months	36
HSE	Skilled	2	12 Months	48
QC	Skilled	3	12 Months	69
Material Management	Skilled	3	12 Months	77
Security	Skilled	3	12 Months	0
Training	Skilled	1	12 Months	0
Surveyor	Skilled	1	12 Months	26
Artisans - Electrical	Skilled	4	12 Months	106
Artisans - Sub-Structure	Skilled	2	12 Months	54
Artisans - Civils	Skilled	2	12 Months	58
Semi Skilled - Electrical	Semi-Skilled	6	12 Months	149
Semi Skilled - Sub-Structure	Semi-Skilled	5	12 Months	128
Civil Semi-skilled operators	Semi-Skilled	11	12 Months	271
Labourers - Electrical	Unskilled	19	12 Months	450
Labourers - Sub-Structure	Unskilled	37	12 Months	885
Labourers - Civils	Unskilled	11	12 Months	270
Fencing Sub-Contractor		0		0
Project-/construction HO Mngmt	Skilled	3	12 Months	60
Quality engineers	Skilled	1	12 Months	22
Total		**128**		

It is anticipated that the construction equipment will include:

- A water tanker,
- A grader,
- A tipper truck,
- Drilling Machine

- Excavator;
- Cement mixers,
- Compaction equipment, and
- Light delivery vehicles.

Operational Phase

The operational phase is expected to last at least 25 years and employ an estimated complement of 12 skilled, 24 semi-skilled and 6 unskilled staff (**Table 7**).

Table 7. Proposed labour force for operational phase.

Job description	Anticipated level of Education and/or skill	Actual number of employees
O&M Exco	Skilled	2
Site Manager	Skilled	2
Site Technician	Skilled	2
Administrator	Skilled	2
Electrical maintenance	Skilled	2
Module cleaning	Semi-Skilled	16
Grounds maintenance	Un-Skilled	5
Offices cleaning	Un-Skilled	1
Security Supervisor	Skilled	2
Security	Semi-Skilled	8
Total		**42**

It is proposed that local labour from the surrounding community would be employed as far as possible.

Decommissioning Phase

The Power Purchase Agreement is valid for a period of 20 years after which the Agreement would be renewed, or the power plant decommissioned, and the site rehabilitated. An extension to the operational life of the plant by as much as 10 to 20 years will depend on the choice of technology and the development of the technology over the first operational period. If the power plant is decommissioned the site would revert to current land use activities (namely the grazing of small game and livestock). During decommissioning, approximately 50 to 100 people would be working on site over a period of six to 12 months. Many the workforce, if not all, would be sourced from the De Aar / Hanover area.

Description of Associated Structures and Infrastructure

Rezoning and land-use

The site is currently zoned *Agricultural* and would need to be rezoned to *Special*, or another appropriate zoning in consultation with the provincial authority in terms of the Northern Cape Planning and Development Act, 1998. A rezoning application will only be prepared and submitted to the Provincial Administration and the local municipality if the proposed project attains preferred bidder status.

Powerlines

The proposed photovoltaic plant would be connected to the Eskom network via either a 132kv powerline that feeds directly or via loop-in loop-out into Hydra Main Transmission Station (MTS) near De Aar or to the 400kv powerline between Hydra and Poseidon MTS, via a loop-in and loop-out connection (see Appendix C for full details and alternatives).

Transformer and inverter

The transformer (22/400 or 22/132 kV 225 MVA sub-station) and photovoltaic inverter would be required for each 1.25 MWac block of modules. The inverter converts the variable DC output of the modules into a utility frequency AC current that can be fed into the commercial electrical grid or used by a local, off-grid electrical network.

Access roads

The main access is off the N10 between De Aar & Hanover, which enters the site from the west. The provincial unsurfaced road (Burgersville Road) and the existing farm access road would also be utilised. Access roads totalling an estimated 14.5 km would be required between the individual solar arrays during the construction phase. It is anticipated that a third (± 5 km) of these roads would remain during the operation phase.
The permanent roads will be approximately 4m wide and remain unsurfaced to facilitate the infiltration of storm water into the soil. Precast box culverts or pipes may be required where the access roads pass through the drainage channels on site. Any fill material required would be obtained from the existing borrow pits on site (no mining permit will be required as per the exemption afforded in section 106 of the MRPDA).

Buildings

Various operations and maintenance buildings would be constructed, including:

- Main building including offices and workshops (± 0.70ha), which would be shared by control and security staff,
- Main electrical substation,
- Transformers (max 500 m² fenced area) and Inverter structures in between arrays (each ± 15 m2) – prefabricated concrete or steel structures, and Transformer structures – small concrete or steel structures. The buildings would be single storey and would be constructed from brick or stone with metal sheet roofing.

No accommodation facilities will be constructed. Staff will be required to leave the site at the end of the day.

Fencing

The proposed plant would be fenced off with a 2.5 m high wire mesh security fence or clear view fencing, with access gained via a security gate.

Visual screening

Depending on the findings of the Visual Impact Assessment, a visual buffer may be required between the external farm boundary along the N10 and the proposed layout of the preferred location.

Services

Water supply

Groundwater would be used for construction and operational purposes. There are several existing boreholes on site, which would be used to abstract groundwater.

There is also a quarry adjacent to the N10 which may be considered if a groundwater constraint exists.

This water would be stored in aboveground JoJo type storage tanks with a capacity not exceeding 100 cubic metres (100 m³), which would be located near the office buildings. It is anticipated that approximately 100 kL of water would be required every 3 months during the operational phase. This water would be used to clean the modules / solar array and general office use (e.g. toilets, drinking water, etc.) and supply water to the sheep that will retain access to the solar farm for grazing purposes as a complementary vegetation management tool. Construction phase water requirements would depend on where the fabrication of certain components of the project would take place. This would require approximately 50 to 75 kL of water per day during the construction phase, including dust suppression along access roads. The affected properties fall within the D62D catchment. General Authorisation GN 538, GG 40243, 2 September 2016 allows for 2000m³ per property per year of surface water and 45m³ per hectare per year of groundwater abstraction and storage. Hence, the water volumes required for the construction phase and operational phases fall well within the promulgated limits.

Electricity supply

Electricity would be obtained from Eskom via the existing supply to the site.

Sewerage treatment

A bio-box package plant for the treatment of effluent to special limits and wastewater from the office buildings. It is envisaged that a maximum of 2 kL of sewage and wastewater would be generated per day.

Waste disposal

All non-recyclable waste would be disposed of at the De Aar licensed landfill site.

SECTION E: DESCRIPTION OF THE POLICY AND LEGISLATIVE CONTEXT

(e) a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;

List of Applicable Legislation and Other Documents

On 04th December, 2014 the Minister of Environmental Affairs, Bomo Edith Molewa promulgated the new EIA Regulations.

The following legislation, guidelines, departmental policies, environmental management instruments and/or other decision-making instruments that have been developed or adopted by a competent authority in respect of activities associated with a development of this nature, were identified and considered in the preparation of this EIA process, and subsequent amendments.

1. Constitution of the Republic of South Africa Act, 1996 (No. 108 of 1996), including section 24;
2. DAFF (1970) Sub-Division of Agricultural Land Act, 1970 (No. 70 of 1970),
3. DEA (2010), Guideline on Need and Desirability, Integrated Management Guideline Series 9, Department of Environmental Affairs (DEA), Pretoria, South Africa.
4. DEA (2010), Public Participation 2010, Integrated Environmental Management Guideline Series 7, Department of Environmental Affairs, Pretoria, South Africa;
5. DEA (2011), National list of ecosystems that are threatened and in need of protection. GN 1002, GG 34809, 9 December 2011.
6. DEA&DP (2010), Guideline on Alternatives, EIA Guideline and Information Document Series. Western Cape Department of Environmental Affairs & Development Planning (DEA&DP);
7. DEAT (2002), Specialist Studies, Information Series 4, Department of Environmental Affairs and Tourism (DEAT), Pretoria;
8. DWAS (2016), General Authorisation in GN No. 509 published in Government Gazette No. 40229 dated 26 August 2016;
9. DWA (2007), Guideline for Developments within a Flood line (Edition 1), Department of Water Affairs and Forestry, Pretoria, South Africa;
10. DWAS (2016), General Authorisation in GN No. 538 published in Government Gazette No. 40243 dated 2 September, 2016;
11. Environment Conservation Act, 1989 (No 73 of 1989), including Schedules 4 and 5 of the National Regulations regarding Noise Control made under Section 25 of the Environment Conservation Act, 1989 (Act 73 of 1989) in GN No. R 154 of Government Gazette No. 13717 dated 10 January 1992. (Note that this particular section of the Environment Conservation Act is not repealed by NEMA (107 of 1998)). Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983);
12. IDP (Final) 2011 – 2016, Emthanjeni Local Municipality;
13. Conservation of Agricultural Resources Act, 1993 (No 43 of 1983) and the regulations dealing with declared weeds and invader plants;
14. Minerals and Petroleum Resources Development Act, 2002 (No 28 of 2002);

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15. National Environmental Management Act, 1998 (No 107 of 1998) including EIA Regulations, 2014 published in Government Notice No. R. 982, R. 983, R. 984 and R. 985 in Government Gazette No. 38282 dated 04 December 2014;
16. Amended EIA Regulations, 2014 published in Government Notice No. R. 324, R. 325, R. 327 and R. 328 in Government Gazette No. 40772 dated 07 April 2017;
17. National Environmental Management: Air Quality Act, 2003 (No 57 of 2003) including the list of activities which result in atmospheric emissions published in GN No. 248 of Government Gazette No. 33064 dated 31 March 2010;
18. National Environmental Management: Biodiversity Act, 2004 (No 10 of 2004);
19. National Environmental Management: Waste Act, 2009 (Act No. 59 of 2009) ("NEM: WA");
20. National Forest Act, 1998 (No 84 of 1998);
21. National Heritage Resources Act, 1999 (No 25 of 1999);
22. National Veld and Forest Fire Act, 1998 (No 101 of 1998);
23. National Water Act, 1998 (Act No. 36 of 1998), Sections 27, 28,29,30,31 and 39 (Sections dealing with General Authorisations and Water Use Licenses);
24. Northern Cape Provincial Spatial Development Framework, (2012);
25. Northern Cape Nature Conservation Act, 2009 (No 9 of 2009);
26. Emthanjeni Local Municipality, 2007 Spatial Development Framework.

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27. Legislative Context of the Proposed Activity

The South African Government has made an international commitment to reduce the country's carbon footprint after adopting an energy generation policy requiring large scale renewable energy projects to reduce the reliance on coal power. The foundations of these plans are within the Integrated Resource Plan (IRP) which details the future energy combination until 2030. The key emphasis is the development of power corridors within which to concentrate energy generation projects to improve the overall energy security of the country. This proposed project is within the Northern Cape power corridor and would be part of moving the IRP forward to achieving its targets and goals.

This EIA forms part of the feasibility study and prerequisite by NERSA for awarding a PPA under the REFIT programme.

A review of the relevant legislation, policies and documents pertaining to the energy sector indicate that solar energy and the establishment of photovoltaic power plants are supported at a national, provincial and local level.

Constitution of the Republic of South Africa Act, 1996 (No. 108 of 1996)

Section 24 of the constitution (below) provides the foundation for environmental protection, promoting ecologically sustainable development and use of natural resources.

Section 24.
Environment. -Everyone has the right-
(a) to an environment that is not harmful to their health or well-being; and
(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that-
(i) prevent pollution and ecological degradation;
(ii) promote conservation; and
(ii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

Importance to the Project: It allows the environmental rights of all South African citizens to be upheld through the implementation of all types of projects, including renewable energy projects.

The National Environmental Management Act, 1998 (No. 107 of 1998)

The National Environmental Management Act (NEMA) 107 of 1998 states that the State must respect, protect, promote and fulfil the social, economic and environmental rights of everyone and strive to meet the needs of previously disadvantaged communities. It states further that sustainable development requires the integration of social, economic and environmental factors in the planning, evaluation and implementation of decisions to ensure that development serves present and future generations.

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Importance to the Project: The project includes several listed activities (**Table 5**), some of which require a Scoping and Environmental Impact Assessment in terms of the GN No. R 984, 2014.

The National Environmental Management: Biodiversity Act No. 10 of 2004

The Act provides the protection of ecosystems and species that require national protection, the sustainable use of indigenous biological resources, the fair and equitable sharing of benefits arising from bio-prospecting involving indigenous biological resources and the establishment and functions of the South African National Biodiversity Institute (SANBI).

Importance to the Project: The EIA process for the project will involve the identification, protection and management of species, ecosystems and areas of high biodiversity value.

The National Water Act No. 36 of 1998

Chapter 1 of the National Water Act (NWA) No. 36 of 1998 states that sustainability and equity are identified as central guiding principles in the protection, use, development, conservation, management and control of water resources. It affirms that the guiding principles recognise the basic human needs of present and future generations and the need to promote social and economic development using water. Chapter 2 of the NWA states amongst others that the purpose of the Act is to ensure that everyone has equitable access to water, and that the results of past racial and gender discrimination are redressed. It aims to promote the efficient, sustainable, and beneficial use of water in the public interest, and to facilitate social and economic development. The NWA recognises that the nations' water resources are held in public trust for the people, and therefore the sustainable, equitable and beneficial use of water resources must serve the peoples' interest.

Importance to the Project: The project will trigger the requirement for water uses under section 21 and a General Authorisation (GA) is being applied for. Permission has been granted from the landowner to use water from existing and licensed boreholes within the general limits prescribed in General Authorisation (GA) for abstraction and storage (GN 538, 2 September 2016). This allows for the "taking" and "storing" of raw water as long as the relevant conditions in the GA are complied with.

The National Heritage Resource Act No. 25 of 1999

The act requires that the responsible heritage resource authority is notified of any new development which will change the character of the site and exceeds an area of 5000 m². The authority must be provided with the site location, details and extent of the proposed development.

Importance to the Project: A heritage impact assessment (HIA) has been completed as part of the EIA process and carried out by person/s approved by the authority.

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National Energy Act, 2008 (No. 34 of 2008)

One of the objectives of the National Energy Act, 2008 (No. 34 of 2008) is to promote the availability of alternative energy resources. In this regard, the preamble makes direct reference to renewable resources, including solar (see extract below).

"To ensure that diverse energy resources are available, in sustainable quantities, and at affordable prices, to the South African economy, in support of economic growth and poverty alleviation, taking into account environmental management requirements …; to provide for … increased generation and consumption of renewable energies …"

Importance to the Project: The project is part of the increased generation of renewable energy and the Act identifies the need for implementing environmental management within the planning of such projects.

Astronomy Geographic Advantage Act, 2007 (Act No. 21 of 2007)

The purpose of the Act is to preserve the geographic advantage areas that attract investment in astronomy. The entire Northern Cape excluding the Sol Plaatjie Municipality had been declared an astronomy advantage area. The Northern Cape optical and radio telescope sites were declared core astronomy advantage areas. The Act allowed the declaration of the Southern Africa Large Telescope (SALT), MeerKat and Square Kilometre Array (SKA) as astronomy and related scientific endeavours that had to be protected.

Importance to the Project: The project is within the Northern Cape geographic advantage area and will need to consult and receive comments from the Southern Africa Large Telescope (SALT).

Electricity Regulation Act, 2006 (Act No. 4 of 2006)

The Act's objective is to provide control over the generation and supply of electricity; and the existence of NERSA and other related matters. The issuing of licences, determination of process, settling disputes, collecting information are the functions of NERSA.

Importance to the Project: The project will require a generation licence from NERSA.

White Paper on the Energy Policy of the Republic of South Africa (1998)

This paper identifies the need for the development and promotion of energy efficiency in South Africa. It requires energy policies to consider 'energy efficiency and energy conservation' within the Integrated Resource Planning (IRP) framework from both supply and demand side in meeting energy service needs;

"Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future".

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The support for renewable energy policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind, such as the proposed De Aar Solar One Photovoltaic Power Project. These renewable applications are in fact in most cases the most cost effective; more so when social and environmental costs are taken into account.

Government policy on renewable energy is thus concerned with meeting the following challenges:

- Ensuring that economically feasible technologies and applications are implemented;
- Ensuring that an equitable level of national resources are invested in renewable technologies, given their potential and compared to investments in other energy supply options; and
- Addressing constraints on the development of the renewable industry.

The White Paper also acknowledges that South Africa, even though the country's renewable energy resource base is extensive and many appropriate applications exist, has neglected the development and implementation of renewable energy applications.

The White Paper also notes that renewable energy applications have specific characteristics that need to be considered.
Advantages include:

- In comparison with traditional supply technologies there are less environmental impacts in operation; and
- Generally high labour intensities and lower running costs and.

Disadvantages include:

- Higher capital costs in some cases;
- Lower energy densities; and
- Depending on specific conditions, especially with sun and wind based systems, provide lower levels of availability.

Importance to the Project: The White Paper underlines the fact that the state must establish a national energy policy which will ensure that the national energy resources shall be adequately tapped and developed to cater for the needs of the nation. Energy should therefore be available to all citizens at an affordable cost. Energy production and distribution should not only be sustainable, but should also lead to improvement of the standard of living for all the country's citizens.

White Paper on Renewable Energy (2003)

Following Cabinet approval of the White Paper, the DoE proceeded with the development of its renewable energy strategy. The implementation plan of the various technologies was identified in a macroeconomic study undertaken in 2003.

The White Paper's target of 10 000GWh renewable energy contribution to final energy consumption by 2013 was confirmed to be economically viable with subsidies and carbon financing. Achieving the target will:

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- Provide approximately 1.667MW new renewable energy capacity, with a positive impact on GDP as high as R1.071 billion per year;
- Secure additional government revenue of 299 million;
- Create additional income flow to low income households by as much as R128 million, stimulating over 20 000 jobs; and
- Lead to water savings of 16.5 million kilolitres, which equates to a R26.6 million saving.

Importance to the Project: The project will support the government's commitment to the introduction of greater levels of competition in electricity markets by promoting renewable energy which will contribute towards the diversification of electricity supply and energy security. Renewable energy that is produced from sustainable natural sources will contribute to sustainable development.

Integrated Resource Plan 2010 (2010)

The Integrated Resource Plan (IRP) 2010-30 was promulgated in March 2011. It was indicated at the time that the IRP should be a "living plan" which would be revised by the Department of Energy (DoE) every two years. Since the promulgation of the Integrated Resource Plan (IRP) 2010-30 there have been a number of developments in the energy sector in South and Southern Africa. In addition, the electricity demand outlook has changed markedly from that expected in 2010. The objective of the IRP 2010 is to develop a sustainable electricity investment strategy for generation capacity and transmission infrastructure for South Africa over the next 25 years. The IRP 2010 is intended to, *inter alia*, consider environmental and other externality impacts and the effect of renewable energy technologies.

The IRP 2010 allocates and allows for;

- 43% of new energy generation facilities in South Africa to renewables;
- for an additional 14 749 MW of renewable energy in the electricity blend in South Africa by 2030; and
- an accelerated roll-out of renewable energy options to derive the benefits of localisation in these technologies.

While there are a number of renewable energy options (including, *inter alia*, wind, solar and hydropower) being pursued in South Africa, many more renewable energy projects are required to meet the targets set by the IRP 2010. With regards to photovoltaic solar energy the IRP 2010 expresses the need for firm commitment to this sector in order to facilitate the connection of the first units to the grid in 2012. It also identifies the need to provide security of investment in order to ramp up a sustainable local industry cluster.

Importance to the Project: The project has the potential to help achieve the national renewable energy targets. The proposed renewable energy development is within the power corridor identified in the Northern Cape and in which renewable energy projects are to be focused to help the provincial energy mix.

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Renewable Energy Feed-in Tariff

The NERSA 'Renewable Energy Feed-in Tariff' (REFIT) guidelines were published in 2009 under the Electricity Regulation Act (Act No. 4 of 2006) pledging attractive rates of payment for renewable energy sold back to the grid. An innovative initiative to encourage investment within the sector of renewable energy and to help achieve the national renewable energy targets.

The REFIT programme involves the following two phases:

- Phase 1: This phase includes quotas for wind, small hydro, landfill gas and Concentrated Solar Power (CSP);
- Phase 2: This phase includes quotas for Solar though without storage and central tower, additional CSP, photovoltaic systems including large ground or roof based, concentrating photovoltaic (CPV) and biomass solid or biogas technologies.

Importance to the Project: The REFIT provides incentives to renewable energy developers, making the developments economically feasible and it will support the achievement of national renewable energy targets.

Northern Cape Provincial Growth and Development Strategy (2004-2014)

At a provincial level, the Northern Cape Provincial Growth and Development Strategy (NCPGDS) refers for the need to ensure the availability of inexpensive energy for the Northern Cape. The NCPGDS notes;

"*the development of energy sources such as solar energy, the natural gas fields, bio-fuels, etc., could be some of the means by which new economic opportunity and activity is generated in the Northern Cape*".

The NCPGDS highlights the importance of close co-operation between the public and private sectors for the economic development potential of the Northern Cape to be realised. The NCPGDS features the importance of enterprise development and noted that current levels of private sector development and investment in the Northern Cape are low. It also noted that the Northern Cape lags in the key policy priority areas of small, medium and micro enterprise (SMME) development and Black Economic Empowerment.

Importance to the Project: The proposed project has the potential to create opportunities that promote private sector investment and the development of SMMEs in the Northern Cape.

Northern Cape Climate Response Strategy

The Northern Cape Government is in the process of finalising a Provincial Climate Change Response Strategy. The key aspects of this strategy were, however, summarised in the MEC's (Northern Cape Provincial Government: Environment and Nature Conservation) 2011 budget speech. These are;

- commitment to develop and implement policy in accord with the National Green Paper for the National Climate Change Response Strategy (2010);
- an acknowledgement of the Northern Cape Province's extreme vulnerability to climate-change driven desertification.

Importance to the Project: The renewable energy sector, including solar and wind energy (but also biofuels and energy from waste), is explicitly identified as an important element of the Provincial Climate Change Response Strategy.

Northern Cape Provincial Spatial Development Framework (2011)

The Northern Cape Provincial Spatial Development Framework (2011) notes that the Northern Cape Province's major energy challenges include securing energy supply to meet growing demand, providing everybody with access to energy services and tackling the causes and impacts of climate change. In this regard, the development of large-scale renewable energy supply schemes is strategically important for increasing the diversity of domestic energy supplies for the Northern Cape Province and avoiding energy imports while minimising the environmental impacts. The Provincial Spatial Development Framework further notes that renewable energy has been identified as a mechanism to diversify the economy and thereby promoting a green economy in the province.

The Provincial Spatial Development Framework also notes that the tourism sector is identified as one of the key sectors with the capacity to 'grow, transform and diversify the provincial economy'. Care therefore needs to be taken to ensure that the development of large renewable energy projects, such as the proposed project; do not affect the tourism potential of the Province.

Importance to the Project: The project will play a part in the Development Framework requirements to promote a greener economy within the province.

Pixley ka Seme District Municipality Integrated Development Plan (IDP) (2009-2012 and 2015-2016)

A key development objective of the Pixley ka Seme District Municipality IDP is to provide all households within the District access to electricity by 2014. To achieve this, the District Municipality aims to fast track the delivery of free basic electricity and co-ordinate the maintenance and upgrading of the existing electricity infrastructure. While no specific mention is made of the promotion of alternative energy sources, the proposed project would potentially support a number of the development goals and objectives of the District.

A Key Performance Area of the 2015-2016 IDP review was to "Reduce greenhouse gas emissions, climate change impacts and improved air quality". Renewable energy projects assist in the mitigation of climate change impacts through reduction in emissions of green-house gases.
The District Municipality has developed its vision, development priorities, objectives and strategies with specific outcomes and outputs for the 2015/16 financial year. They are informed by the development goals/agendas of the policy document:

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- Solar/Wind Energy projects

Importance to the Project: This renewable energy project will work towards the IDP goals of reducing greenhouse gas emissions, climate change and improving the air quality within the District.

District Renewable Energy Hub (Draft Concept Document)

The District Renewable Energy Hub Draft Conceptual Document (26 February 2010) drafted by the Local Economic Development Division of the Pixley ka Seme District Municipality has proposed the development of a Renewable Energy Hub along the N10 corridor and around the town of De Aar. The draft concept document outlines the proposed strategy, which is in line with both the National and Provincial policy with respect to renewable energy generation.

The Renewable Energy Hub is seen as a critical component to the revitalisation of both the broader District and the town of De Aar. The District is well positioned for renewable energy development (including solar, wind, biomass and hydro-electric) due to the ample availability of suitable land, and the existence of adequate existing infrastructure.

It is envisaged that the Hub will;

- attract both local and foreign investors and research institutions;
- alleviate the increasing demand on electricity nationally;
- reduce South Africa's dependence on fossil fuel;
- create employment and downstream business opportunities for local entrepreneurs; and
- utilise the high insolation rates and steady winds.

Importance to the Project: The concept of the Renewable Energy Hub would require projects such as this proposed Solar PV plant located in the Hub to be developed and help reduce South Africa's reliance on fossil fuels.

Emthanjeni Local Municipality IDP (May 2012)

The ELM IDP lists a number of industrial and manufacturing projects that form part of the larger strategy for the economic development of the municipality. One of these projects includes the establishment of De Aar as a Renewable Energy Hub. Basic service delivery, with energy as one of the priority issues, micro- and macro-economic development as well as land use management have been highlighted as key performance areas to be addressed within the ELM. IDP.

Importance to the Project: The establishment of the proposed photovoltaic power plant has the potential to support several key strategies in the ELM.

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SECTION F: MOTIVATION FOR THE NEED AND DESIRABILITY FOR THE PROPOSED ACTIVITY

(f) A motivation for the need and desirability for the preferred [location] development footprint within the approved site as contemplated in the accepted scoping report;

Legislative Background and Strategic Context

National Environmental Management Principles of NEMA, 1998, which guide the interpretation, administration and implementation of NEMA, 1998 (and the EIA Regulations, 2014) specifically *inter alia* require that environmental management must place people and their needs at the forefront of its concern (Section 2(2)). The latter refers to the broader societal/community needs and interests, and is put into effect through the EIA Regulations, 2014, which require environmental impact assessments to specifically consider 'need and desirability' in order to ensure that the 'best practicable environmental option' is pursued and that development more equitably serves broader societal needs now and in the future. Furthermore, it ensures that the proposed actions of individuals are measured against the long-term public interest.

What is needed and desired for a specific area must be strategically and democratically determined (DEA&DP (2010) Guideline on Need and Desirability). The strategic context for informing need and desirability is best addressed and determined during the formulation of the sustainable development vision, goals and objectives of Integrated Development Plans ('IDPs') and Spatial Development Frameworks ('SDFs') during which collaborative and participative processes play an integral part, and are given effect to, in the democratic processes at local government level (DEA&DP (2010) Guideline on Need and Desirability). The need and desirability must therefore be measured against the contents of the credible IDP, SDF and EMF for the area, and the sustainable development vision, goals and objectives formulated in, and the desired spatial form and pattern of land use reflected in, the area's IDP and SDF (DEA&DP (2010) Guideline on Need and Desirability). Integrated Development Planning (and the SDF process) effectively maps the desired route and destination, whilst the project-level EIA decision-making finds the alternative that will achieve the desired goal (DEA&DP (2010) Guideline on Need and Desirability). However, inadequate planning or the absence of a credible IDP and SDF means that the EIA has to address the broader need and desirability considerations. Consequently, 'need and desirability' is determined by considering the broader community's needs and interests as reflected in a credible IDP, SDF and EMF for the area, and as determined in the EIA decision-making process.

Furthermore, the Constitution calls for *justifiable* economic development. The specific needs of the broader community must therefore be considered together with the opportunity costs and distributional consequences to determine whether or not the development is 'justified'.

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The general meaning of need and desirability refers to time and place, respectively, i.e. is this the right time and is it the right place for locating the proposed activity. The need and desirability of this application was addressed separately and in detail by answering *inter alia* the following questions:

1. How will this development (and its separate elements/aspects) impact on the ecological integrity of the area?

Due mainly to the prevailing unfavorable climatic conditions for arable agriculture, as well as the prevalence of soils with limited depth, the farm does not have a high agricultural potential. Furthermore, the proposed project plans to integrate with the current small livestock and game farming practices, increasing the profitability and optimising the opportunity costs of the property. While the solar PV farm will result in environmental impacts through disturbance to in situ vegetation, in the medium to long-term, it is possible that due to the creation of microclimates created beneath the solar panel arrays, a higher net primary production may result, effectively increasing the grazing capacity of the land. This aspect will be quantitatively monitored through an ecological management plan.

1.1. How were the following ecological integrity considerations taken into account?

1.1.1. Threatened Ecosystems:

The potential impacts and quantification of cumulative impacts were assessed by the following appointed specialists in relation to threatened ecosystems:

- Terrestrial Ecology, specifically the impacts on the existing wetlands condition and associated fauna and flora;
- Grazing capacity determination and soil mapping;
- Wetland Assessment; and
- Bat Study.

The cumulative impact on the vegetation, freshwater resources and groundwater are considered to range from VERY LOW to LOW significance with mitigation. All cumulative impacts on terrestrial fauna are of LOW significance, except the potential increase in bird strikes which is of MEDIUM significance.

The impact assessment shows that almost all identified impacts can be affectively mitigated, indicating that the cumulative impact effect will also be mitigated.
(Refer to Appendix E&F)

1.1.2. Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure,

The impact assessment shows that almost all identified impacts can be affectively mitigated, indicating that the cumulative impact effect will also be mitigated. Additional impacts and quantification of cumulative impacts were assessed by the following appointed specialists:

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- Terrestrial Ecology, specifically the impacts on the existing wetlands condition and associated fauna and flora;
- Grazing capacity determination and soil mapping;
- Wetland Assessment;
- Hydrological Assessment;
- Aquatic Assessment;
- Bat Study; and
- Hydrological

The hydrological specialist findings for potential impacts on water quality of tributary of the Brak River from the proposed development were low and no impact on the catchment yield (Quantity).
(Refer to Appendix E&F)

1.1.3. Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs"),

A fauna & flora (terrestrial ecology) study was undertaken. (Appendix F Annexure G)

Since there is a Critical Biodiversity Area (CBA) within the original footprint, it has been significantly reduced. The ability to expand the footprint into the adjacent approved site have been restricted due to sensitive areas and geotechnical aspects including shallow dolerite sills. This alternative has a fatal flaw as a preferred option as it cannot accommodate the 225MW PV Plant.

1.1.4. Conservation targets,
The potential impacts and quantification of conservation targets were assessed by the following appointed specialists in relation to threatened ecosystems:

- Terrestrial Ecology, specifically the impacts on the existing wetlands condition and associated fauna and flora;
- Grazing capacity determination and soil mapping;
- Wetland Assessment;
- Hydrological Assessment;
- Aquatic Assessment;
- Bat Study; and
- Hydrological

The impact assessment shows that almost all identified impacts can be affectively mitigated, indicating that the cumulative impact effect will also be mitigated. (Refer to Appendix E&F)

1.1.5. Ecological drivers of the ecosystem,
A fauna & flora (terrestrial ecology) study was undertaken. (Appendix F Annexure G)

1.1.6. Environmental Management Framework,

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The municipality does not have an EMF in place, but sensitivity analyses were undertaken using the National Biodiversity Planning datasets. However, page 19 of the GG # 40445 - 25 November 2016, states that Solar PV and CSP with storage present excellent opportunities to diversify the electricity mix, to produce distributed generation and to provide off-grid electricity. Solar technologies also present the greatest potential for job creation and localisation. Incentive programmes and special focused programmes to promote further development in the technology, as well as solar roll-out programmes, should be pursued.

1.1.7. Spatial Development Framework,

- The proposed project will contribute to the economic stability of the area by establishing a sustainable industry on a property that has low agricultural potential (Page 41, FEIR by CCA Environmental Ltd for Business Venture Investments 1421 Ltd, August 2012).
- At a provincial level, the Northern Cape Provincial Spatial Development Framework (PSDF, 2012) notes that the Northern Cape Province's major energy challenges include securing energy supply to meet growing demand, providing everybody with access to energy services and tackling the causes and impacts of climate change. In this regard, the development of large scale renewable energy supply schemes is strategically important for increasing the diversity of domestic energy supplies for the Northern Cape Province and avoiding energy imports while minimising the environmental impacts. The PSDF further notes that renewable energy has been identified as a mechanism to diversify the economy and thereby promoting a green economy in the province (Page 41, FEIR by CCA Environmental(Pty)Ltd for Business Venture Investments 1421 (Pty) Ltd, August 2012).
- The Northern Cape Provincial Growth and Development Strategy (NCPGDS) states that the development of new sources of energy through the promotion of the adoption of energy applications that display a synergy with the province's natural resource endowments must be encouraged. In this regard, the NCPGDS notes that the development of energy sources such as solar energy could be a means by which new economic opportunity and activity is generated in the Northern Cape. The NCPGDS also highlights the importance of close co-operation between the public and private sectors for the economic development potential of the Northern Cape to be realised (Page 41, FEIR by CCA Environmental (Pty) Ltd for Business Venture Investments 1421 (Pty) Ltd, August 2012).
- The ELM IDP lists a number of industrial and manufacturing projects that form part of the larger strategy for the economic development of the municipality. One of these projects includes the establishment of De Aar as a Renewable Energy Hub. Basic service delivery, with energy as one of the priority issues, micro- and macro-economic development as well as land use management have been highlighted as key performance areas to be addressed within the ELM. The establishment of the proposed photovoltaic power plant has the potential to support a number of key strategies in the ELM IDP (Page 41, FEIR by CCA Environmental (Pty)Ltd for Business Venture Investments 1421 (Pty) Ltd, August 2012).
- The White Paper on Renewable Energy (2003) had set a target of 10 000 GWh of energy to be produced from renewable energy sources (mainly biomass, wind, solar, and small-scale hydro) by

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2013. The proposed Solar PV will help the Municipality reach their targets set for 2013 through to 2016 of increasing their energy sources. Page 65(Northern Cape PSDF 22Aug12).

- There is a national electricity supply shortage and the country is now in a position where it needs to commission additional plants urgently. Consequently, renewable energy projects are a high priority. Page 139(Northern Cape PSDF 22Aug12).
- On the List of Community and/or Stakeholder Priority Issues tabled on C1 (Pg 46 Emthanjeni IDP – 2006 -2011), states that Ward 6, needs an improvement of electricity supply and roads to be a prioritized need.
- Municipalities should plan ahead regarding areas of need and synchronise this with the supply of electricity by ESKOM, the sole organization with the responsibility for the bulk supply of electricity. With the objective of eliminating backlog by providing access to electricity. A plan should be developed that would enable integrated implementation of these plans, with Eskom. (PkSDGDS) – 2006-2016, page 91).
- There has been an increase in the use of electricity as an energy source. Emthanjeni is one of the municipalities with a high number of backlogs within the District (PkSDGDS) – 2006-2016, page 150).
- Within the district, Emthanjeni Municipality has the highest number (92.6%) of people with electricity, so the municipality can never have more than enough electricity. Lack of access to electricity for all is amongst the district needs that need to be addressed. This project will help ensure that such needs are met. (PkSDGDS) – 2006-2016, page 150). Amongst the identified development priorities of the Council during the 2015/2016 financial years, was electricity (PkSDGDS) – 2006-2016, page 229).

1.1.8. Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.).

- The proposed project would strengthen the local electricity grid for the area and contribute to meeting the national renewable energy targets set by the Department of Energy (DoE).
- There is a national electricity supply shortage and the country is now in a position where it needs to commission additional plants urgently. Consequently, renewable energy projects are a high priority. Page 139(Northern Cape PSDF 22Aug12).
- The key objectives of the White Paper were considered in the five major facilitative areas below:

Financial instruments

- To ensure that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply;
- To set targets for directing of public resources for implementation of renewable energy technologies;
- To extend existing state financial support systems and institutions and introduce sustainable financing mechanisms for delivering renewable energy systems;
- To introduce suitable fiscal incentives for renewable energy;
- To create an investment climate for the development of the renewable energy sector, which would make it easy to attract foreign and local investors.

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Legal instruments

- To develop an appropriate legal and regulatory framework for pricing and tariff structures to support the integration of renewable energy into the energy economy and to attract investors;
- To develop an enabling legislative and regulatory framework to integrate independent power producers into existing electricity systems;
- To develop an enabling legislative framework to integrate local producers of liquid fuels and gas from renewable resources into their respective systems.

Technology development

- To promote the development and implementation of appropriate standards and guidelines and codes of practice for the appropriate use of renewable energy technologies;
- To support appropriate research and development and local manufacturing to strengthen renewable energy technology and optimise its implementation.

Awareness raising, capacity building and education

- To promote knowledge of renewable energy and increase its use;
- To promote and stimulate the renewable energy market through dissemination of information on economic, environmental, social and trade benefits of renewable energy technologies and their applications. To persuade institutions to implement training and education programs on renewable energy;
- To actively involve women in decision-making and planning on renewable energy activities;
- To improve communication and interaction between Government and other institutions on renewable energy policies.

Governance

- The Department of Minerals and Energy (now the Department of Energy; DoE) would take overall responsibility for the development of renewable energy policy coordination in South Africa, but would work with the necessary government departments to create the required enabling environment, i.e. the devolution of responsibility to the most appropriate level of government;
- The National Energy Regulator, the South African Bureau of Standards and the Central Energy Fund are specifically cited as key role players (Page 32 & 33 of the State of Renewable Energy in SA, 2015).

1.2. How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?

All the specialist findings were populated onto a GIS map to produce no go areas for the proposed development footprint which has removed critical biodiversity areas, wetlands and flood plains within the unnamed tributary of the Brak river catchment.

The impact assessment shows that almost all identified impacts can be affectively mitigated, indicating that the cumulative impact effect will also be mitigated. Additional impacts and quantification of cumulative impacts were assessed by the following appointed specialists:

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- Terrestrial Ecology, specifically the impacts on the existing wetlands condition and associated fauna and flora;
- Grazing capacity determination and soil mapping;
- Wetland Assessment;
- Hydrological Assessment;
- Aquatic Assessment;
- Bat Study; and
- Hydrological

(Refer to Appendix E&F)

1.3. How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?

An Impact Assessment that was undertaken to address and tackle impacts that might occur, measures that were explored to avoid, reduce and/or remedy these impacts. (Appendix E Annexure A)

1.4. What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?

Construction waste, general waste and disposal of the PV panels is going to be generated by this development. Measures that were explored to minimise, reuse and/or recycle the waste are discussed in the Environmental Management Programme. (Appendix G)

1.5. How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?

The Visual & Heritage Impact Assessment that was undertaken addresses how this development will disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage.(Appendix F Annexures A&B)

1.6. How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?

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Please refer to the Impact Assessment on Appendix E Annexure A

1.7. How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts?

Please refer to the Impact Assessment on Appendix E Annexure A

1.7.1. Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? (note: sustainability requires that settlements reduce their ecological footprint by using less material and energy demands and reduce the amount of waste they generate, without compromising their quest to improve their quality of life)

Not at all, electricity will be obtained from Eskom via the existing supply to the site. The proposed project would strengthen the local electricity grid for the area and thus improve the available electrical services. In terms of water requirements, the proposed project will utilise groundwater from existing boreholes on the property or if needed surface water accumulating in a disused stone quarry. All non-recyclable waste would be disposed of at the De Aar licensed landfill site. Installation of bio-box package plant to treatment effluent to special limits would be used to treat sewage and wastewater from the office buildings.

1.7.2. Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources this the proposed development alternative?)

- The proposed project will be undertaken and implemented in conjunction with the pre-existing land use practices, the opportunity costs associated with the combined land uses are greatly improved. But the potential impacts associated with the proposed project are nonetheless to be assessed by appointed specialists that will concentrate on appropriate environmental aspects related to the proposed activity. These will be on a bio-physical and socio-economic level to determine whether or not replacing the current land use or next best alternative will create an unacceptable loss in opportunity costs. The project design alternatives will be selected in order to reduce any impact on the current land use of grazing including Solar PV arrays to be one (1) metre height in order for livestock grazing to continue below. The project is predicated to provide a positive impact on the local area including electricity from a non-polluting renewable

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energy source, benefits to job creation and skills development. It is therefore anticipated that there will not be any unacceptable opportunity costs.

- South Africa experiences some of the highest levels of solar radiation in the world and this renewable resource holds great potential for the country. The total area of high radiation in South Africa amounts to approximately 194 000 km2, including the Northern Cape, which is one of the best solar resource areas in the world. With electricity production per square kilometre of mirror surface in a solar thermal power station being 30.2 MW, and just 1% of the high radiation area in the country being made available for solar power generation, the generation potential is approximately 64 GW. Solar energy has the potential to contribute quite substantially to South Africa's future energy needs. This would, however, require large investments in transmission lines from the areas of high radiation to the main electricity consumer centres. (Page 53 GG # 40445 - 25 November 2016).

1.7.3. Do the proposed location, type and scale of development promote a reduced dependency on resources?

- The location factors are favourable for the development of a Solar PV plant including high and good quality solar irradiation, flat and gentle slopes and close proximity to existing Eskom infrastructure including powerlines to feed into the grid and the N10 for transport links.
- In South Africa's growing RE footprint, The Northern Cape, offers the most favourable solar radiation levels, has attracted the majority of the Solar PV projects and all of the CSP projects. The province, host to 48 of the 92 IPP projects in the country, is expected to contribute 3,566MW to the total procured RE capacity once construction is complete (Page 96 of the State of Renewable Energy in SA, 2015).

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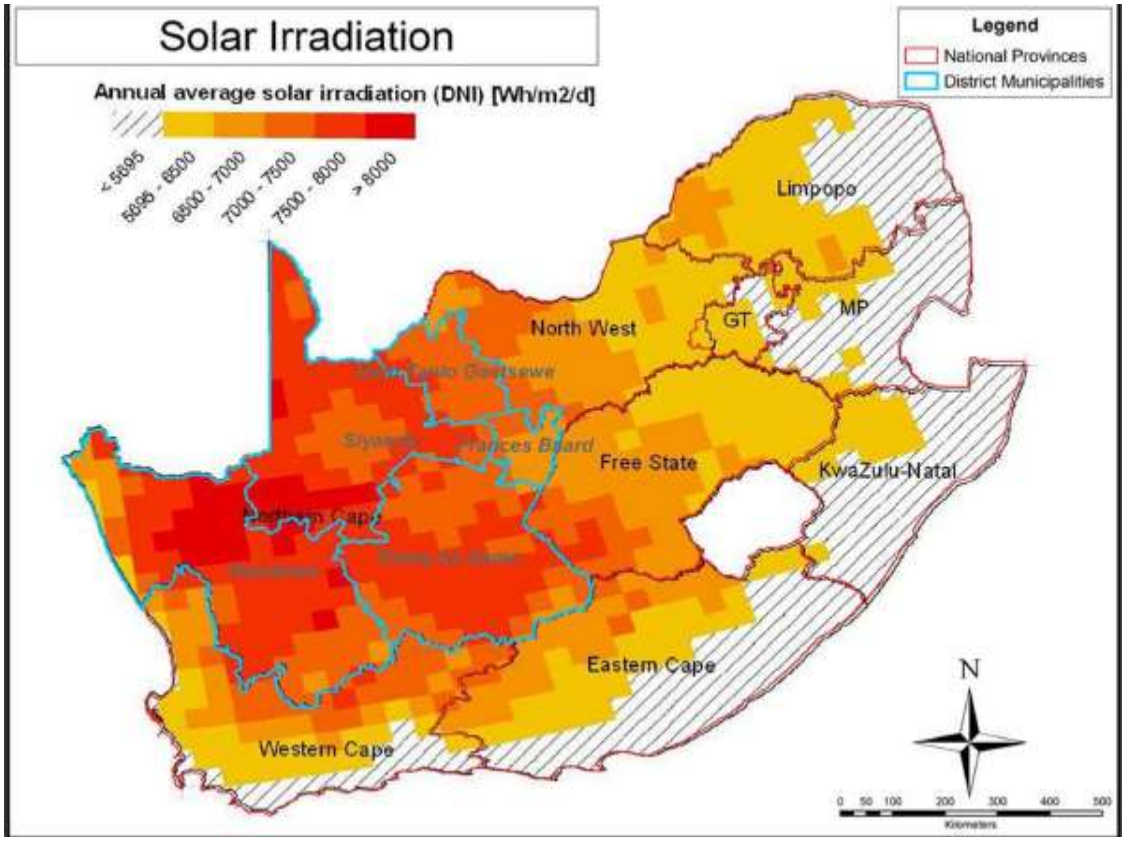

- **Figure 3**. Solar irradiation map indicating the suitability of the Northern Cape for solar related projects (IDP, 2015-2016).

1.8. How were a risk-averse and cautious approach applied in terms of ecological impacts?:

Refer to fauna & flora (terrestrial ecology) study (Appendix F Annexure G).

1.8.1. What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?

Refer to Impact Assessment (Appendix E Annexure A), where each aspect of the proposed project lists the gaps, uncertainties and assumptions associated with the project.

1.8.2. What is the level of risk associated with the limits of current knowledge?

Minimal to intermediate.

1.8.3. Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?

Environmental impacts are defined as any change to the environment, whether adverse or beneficial, wholly or partially resulting from those elements of the proposed activities that can interact with the environment. Consequently, the activities were identified, before their impacts could be predicted.

Safety nets were considered to capture those elements that were unidentified. Finally, mitigations were sought and tailored to counteract the project-specific impacts and achieve particular goals and objectives in line with environmental best practices. Finally an Environmental Management Programme (Appendix G) was formulated to help minimise and/or avoid any risks that might occur.

1.9. How will the ecological impacts resulting from this development impact on people's environmental right in terms following:

1.9.1. Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?

The impact assessment shows that almost all identified impacts can be affectively mitigated, indicating that the cumulative impact effect will also be mitigated. Additional impacts and quantification of cumulative impacts were assessed by the following appointed specialists:

- Terrestrial Ecology, specifically the impacts on the existing wetlands condition and associated fauna and flora;
- Grazing capacity determination and soil mapping;
- Wetland Assessment;
- Visual Impact;
- Social Impact;
- Heritage Impact;
- Geo-technical; and
- Traffic Study.

(Refer to Appendix E&F)

Measures taken to avoid negative impacts, but if avoidance is not possible, to minimize, manage and remedy negative impacts are on the Environmental Management Programme (Appendix G).

1.9.2. Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?

- The proposed project will be undertaken and implemented in conjunction with the pre-existing land use practices, the opportunity costs associated with the combined land uses are greatly improved. But the potential impacts associated with the proposed project are nonetheless to be assessed by appointed specialists that will concentrate on appropriate environmental aspects related to the proposed activity. These will be on a bio-physical and socio-economic level to determine whether or not replacing the current land use or next best alternative will create an unacceptable loss in opportunity costs. The project design alternatives will be selected in order to reduce any impact on the current land use of grazing including Solar PV arrays to be one (1) metre height in order for livestock grazing to continue below. The project is predicated to provide a positive impact on the local area including electricity from a non-polluting renewable

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energy source, benefits to job creation and skills development. It is therefore anticipated that there will not be any unacceptable opportunity costs.

- South Africa experiences some of the highest levels of solar radiation in the world and this renewable resource holds great potential for the country. The total area of high radiation in South Africa amounts to approximately 194 000 km2, including the Northern Cape, which is one of the best solar resource areas in the world. With electricity production per square kilometre of mirror surface in a solar thermal power station being 30.2 MW, and just 1% of the high radiation area in the country being made available for solar power generation, the generation potential is approximately 64 GW. Solar energy has the potential to contribute quite substantially to South Africa's future energy needs. This would, however, require large investments in transmission lines from the areas of high radiation to the main electricity consumer centres. (Page 53 GG # 40445 - 25 November 2016).

1.10. Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?

Refer to Specialist Reports on Appendix F.

1.11. Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives/targets/considerations of the area?

Refer to Fauna & Flora (terrestrial ecology) study report on Appendix F Annexure G.

1.12. Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?

Refer to Alternatives Section H.

1.13. Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?

Refer to Impact Assessment on Appendix E Annexure A.

<u>2.1. What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?</u>

2.1.1. The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area,

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- The proposed project is in line with the initiatives of the ELM IDP to support economic growth, create job opportunities for local communities and establish De Aar as a Renewable Energy Hub.

- On the List of Community and/or Stakeholder Priority Issues tabled on C1 (Pg 46 Emthanjeni IDP – 2006 -2011), states that Ward 6, needs an improvement of electricity supply and roads to be a prioritized need.
- Under the topic of diversified energy mix, concerning Solar, the following points are stated

(1) Solar should play a much more significant role in the electricity generation mix than it has done historically, and constitutes the greatest share of primary energy (in terms of total installed capacity) by 2050. The contribution of solar in the energy mix comprises both CSP and solar PV. Solar PV includes large scale installations for power generation which supply to the grid and individual, off-grid solar home systems and rooftop panels.

(2) Several interventions which could enhance the future solar energy landscape are recommended as follows:

- Large scale CSP projects with proven thermal storage technologies and hybridisation/industrial steam application projects should be incentivised in the short to medium term. In the long term the existing incentives could be extended to promote locally developed CSP technology storage solutions and large scale solar fuel projects.
- A thorough solar resource assessment for South Africa should continue to be undertaken in the Northern Cape Province and extended to other provinces deemed to have high solar radiation levels.
- Investments should be made to upgrade the grid in order to accommodate increasing solar and other renewable energy contributions (Page 165 & 166 of the GG # 40445 - 25 November 2016).

2.1.2. Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.),

- The proposed project would contribute to the economic stability of the area by establishing a sustainable industry on a property that has low agricultural potential. (Page 41, FEIR by CCA Environmental(Pty)Ltd for Business Venture Investments 1421 (Pty) Ltd, August 2012)
- At a provincial level, the Northern Cape Provincial Spatial Development Framework (PSDF, 2012) notes that the Northern Cape Province's major energy challenges include securing energy supply to meet growing demand, providing everybody with access to energy services and tackling the causes and impacts of climate change. In this regard, the development of large scale renewable energy supply schemes is strategically important for increasing the diversity of domestic energy supplies for the Northern Cape Province and avoiding energy imports while minimising the environmental impacts. The PSDF further notes that renewable energy has been identified as a mechanism to diversify the economy and thereby promoting a green economy in the province (Page 41, FEIR by CCA Environmental(Pty)Ltd for Business Venture Investments 1421 (Pty) Ltd, August 2012).

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2.1.3. Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and

- In the Northern Cape Province, exceptionally high radiation levels make the province particularly suited for power generation from solar energy. Besides solar, the province also has potential for Wind, Hydro and Biomass power generation.

 The Northern Cape Provincial Spatial Development Framework (2012) specifically recognises the potential for solar development in the province, identified with the introduction of a solar corridor stretching between ZFMgcawu and the Pixley ka Seme regions and the solar-themed special economic zone (SEZ) in Khara Hais Municipality.

2.1.4. Municipal Economic Development Strategy ("LED Strategy").

- The project outcomes align with the national, local and regional planning objectives in terms of economic development and sustainability. The project will use a natural, renewable resource and assist with decreasing the country's reliance on coal as a source of energy. The project will not affect the environmental rights of any of the affected stakeholder groups and no-one's livelihoods will be affected in a negative manner. The project will contribute to livelihood strategies of stakeholders in the area – directly through job creation and secondary economic opportunities, and indirectly through enterprise and socio-economic development by means of a community trust. Should the mitigation measures be implemented as recommended, the contribution to long-term sustainable outcomes will be significant. The project will complement the socio-economic benefits in the area. Given the rural setting of the site there will be a need to transport goods and people over a distance, but the negative impact of this aspect can be mitigated by the secondary economic opportunities that the need for transport service providers will create. There are vulnerable people that will be affected by the project. The vulnerable groups include the poor and unemployed people in the urban areas, and the farm workers in the rural areas. In terms of participation a non-technical background information document aimed at these groups were produced and presented in Afrikaans, which is the dominant language in the area, and English. The project offers opportunities for semi- and unskilled labourers, which will ensure that the vulnerable groups are not excluded from economic opportunities. Mitigation measures on how to enhance these opportunities are suggested in the report. The mitigation measures include aspects such as gender equality. The project will not result in any unfair discrimination or affect the social and environmental rights of any of the stakeholder groups, should the mitigation measures be implemented as suggested. From a social perspective the positive impact that the project will have on the affected environment outweighs the negative impacts by far, and where there are negative impacts, it can be mitigated (Social Impact Assessment Report by Equispectives Research & Consulting Services, March 2017)

<u>2.2. Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area?</u>

Refer to Social Impact Study report (Appendix F Annexure F)

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2.2.1. Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?

Refer to Social Impact Study report (Appendix F Annexure F)

2.3. How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?

The EAP in conjunction with the Project Proponent and land owners has conducted a desk top study using GIS spatial analysis to identify potential development footprints that will have the least impact on the local environment. This exercise was followed up by a site inspection to ground truth the information collected from the desk top study. These findings have identified the potential environmental aspects and impacts that were further assessed by the appointed Specialists inputs during the scoping phase.
Refer to Appendix F.

2.4. Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? Will the impact be socially and economically sustainable in the short- and long-term?

Refer to Social Impact Study report (Appendix F Annexure F)

2.5. In terms of location, describe how the placement of the proposed development will:
2.5.1. result in the creation of residential and employment opportunities in close proximity to or integrated with each other,

Refer to Social Impact Study report (Appendix F Annexure F)
2.5.2. reduce the need for transport of people and goods,
Refer to Social Impact Study report (Appendix F Annexure F)

2.5.3. result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport),

- The N10 has been identified as a central part of the energy hub;
- The project list is incorporated in the IDP based on the needs of the community. The critical areas remain Infrastructure and Local Economic Development. Within the limited resources of the Municipality it will have to address the following;

❖ Roads
❖ Storm water
❖ Housing delivery (servicing of sites)
❖ Bulk services (**electricity**, water)
❖ Support to SMME's

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- Sewerage.

2.5.4. compliment other uses in the area,

- The project list is incorporated in the IDP based on the needs of the community. The critical areas remain Infrastructure and Local Economic Development. Within the limited resources of the Municipality it will have to address the following;

- Roads
- Storm water
- Housing delivery (servicing of sites)
- Bulk services (**electricity**, water)
- Support to SMME's
- Sewerage.

2.5.5. be in line with the planning for the area,

- The ELM IDP recognises the need for economic growth and the creation of employment opportunities for local people (Page 42, FEIR by CCA Environmental(Pty)Ltd for Business Venture Investments 1421 (Pty) Ltd, August 2012).;
- Amongst the identified development priorities of the Council during the 2015/2016 financial years, was electricity (PkSDGDS) – 2006-2016, page 229).
- Energy is essential to many human activities and is critical to the social and economic development of a country. One of the key objectives of the Department of Energy (DoE) is to ensure energy security which, in essence, is about ensuring the availability of energy resources, and access to energy services in an affordable and sustainable manner, while minimising the associated adverse environmental impacts. Many factors pose potential threats to energy security including scarce and depleting energy resources, geopolitical instability, inadequate energy infrastructure and, more recently, natural disasters. To ensure continued security of energy supply, it is essential that a co-ordinated and integrated approach to energy planning, which takes into account these complex issues, is undertaken (Page 11 & 12 of GG # 40445 - 25 November 2016).

- South Africa needs to grow its energy supply to support economic expansion and in so doing, alleviate supply bottlenecks and supply-demand deficits. In addition, it is essential that all citizens are provided with clean and modern forms of energy at an affordable price. From the myriad of factors which had to be considered and addressed during the Integrated Energy Planning process, eight key objectives were identified:
- Objective 1: Ensure security of supply;
- Objective 2: Minimise the cost of energy;
- Objective 3: Promote the creation of jobs and localisation;
- Objective 4: Minimise negative environmental impacts from the energy sector;
- Objective 5: Promote the conservation of water;
- Objective 6: Diversify supply sources and primary sources of energy;
- Objective 7: Promote energy efficiency in the economy; and

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- Objective 8: Increase access to modern energy.

2.5.6. for urban related development, make use of underutilized land available with the urban edge,

- The location factors are favourable for the development of a Solar PV plant including high and good quality solar irradiation, flat and gentle slopes and close proximity to existing Eskom infrastructure including powerlines to feed into the grid and the N10 for transport links.
- In South Africa's growing RE footprint, The Northern Cape, offers the most favourable solar radiation levels, has attracted the majority of the Solar PV projects and all of the CSP projects. The province, host to 48 of the 92 IPP projects in the country, is expected to contribute 3,566MW to the total procured RE capacity once construction is complete (Page 96 of the State of Renewable Energy in SA, 2015).

2.5.7. optimize the use of existing resources and infrastructure,

Electricity will be obtained from Eskom via the existing supply to the site. The proposed project would strengthen the local electricity grid for the area and thus improve the available electrical services. In terms of water requirements, the proposed project will utilize groundwater from existing boreholes on the property or if needed surface water accumulating in a disused stone quarry. All non-recyclable waste would be disposed of at the De Aar licensed landfill site. Installation of bio-box package plant to treatment effluent to special limits would be used to treat sewage and wastewater from the office buildings.

2.5.8. opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement),

- The District Municipality has proactively diversified its economy away from mining and agriculture through innovative local economic development initiatives, declaring themselves as a Renewable Energy Hub, seeking to attract foreign direct investment into solar, wind, hydro and biomass projects.
- Amongst the identified development priorities of the Council during the 2015/2016 financial years, was electricity (PkSDGDS) – 2006-2016, page 229).
- In South Africa's growing RE footprint, The Northern Cape, offers the most favourable solar radiation levels, has attracted the majority of the Solar PV projects and all of the CSP projects. The province, host to 48 of the 92 IPP projects in the country, is expected to contribute 3,566MW to the total procured RE capacity once construction is complete (Page 96 of the State of Renewable Energy in SA, 2015).

2.5.9. discourage "urban sprawl" and contribute to compaction/densification,

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- The location factors are favourable for the development of a Solar PV plant including high and good quality solar irradiation, flat and gentle slopes and close proximity to existing Eskom infrastructure including powerlines to feed into the grid and the N10 for transport links.
- In South Africa's growing RE footprint, The Northern Cape, offers the most favourable solar radiation levels, has attracted the majority of the Solar PV projects and all of the CSP projects. The province, host to 48 of the 92 IPP projects in the country, is expected to contribute 3,566MW to the total procured RE capacity once construction is complete (Page 96 of the State of Renewable Energy in SA, 2015).

2.5.10. contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs,

- The Municipality has agreed on seven (7) Strategic Objectives (STO) that are to be achieved;

1. Provision of access to all basic services rendered to residents within the available resources.
2. Development and transformation of the institution with the aim of capacitating the municipality in meeting their objectives.
3. Promote the equitable creation and distribution of wealth in Emthanjeni Municipal area.
4. Maintaining a financially sustainable and viable Municipality.
5. Promote representative governance through the sustainable utilization of available resources in consultation with the residents of Emthanjeni Municipality.
6. Contribute to the creation of communities where residents and visitors can work, live and play without threat to themselves or their properties.
7. Contribute to the development and protection of the rights and needs of all residents with a particular focus on the poor.

2.5.11. encourage environmentally sustainable land development practices and processes,

The proposed project plans to integrate with the current small livestock and game farming practices, increasing the profitability and optimises the opportunity costs of the property. While the solar PV farm will result in environmental impacts through disturbance to in situ vegetation, in the medium to long-term, it is possible that due to the creation of microclimates created beneath the solar panel arrays, a higher nett primary production may result, effectively increasing the grazing capacity of the land. This aspect will be quantitatively monitored through an ecological management plan.

Electricity will be obtained from Eskom via the existing supply to the site. The proposed project would strengthen the local electricity grid for the area and thus improve the available electrical services. In terms of water requirements, the proposed project will utilise groundwater from existing boreholes on the property or if needed surface water accumulating in a disused stone quarry. All non-recyclable waste would be disposed of at the De Aar licensed landfill site. Installation of bio-box package plant to treatment effluent to special limits would be used to treat sewage and wastewater from the office buildings.

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2.5.12. take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.),

- The location factors are favourable for the development of a Solar PV plant including high and good quality solar irradiation, flat and gentle slopes and close proximity to existing Eskom infrastructure including powerlines to feed into the grid and the N10 for transport links.
- In South Africa's growing RE footprint, The Northern Cape, offers the most favourable solar radiation levels, has attracted the majority of the Solar PV projects and all of the CSP projects. The province, host to 48 of the 92 IPP projects in the country, is expected to contribute 3,566MW to the total procured RE capacity once construction is complete (Page 96 of the State of Renewable Energy in SA, 2015).

2.5.13. the investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential),

- The province intends to become a net producer of RE to the rest of the country by 2020, inviting investment and development into the province (Page 56 of the State of Renewable Energy in SA, 2015).
  - Within the district, Emthanjeni Municipality has the highest number (92.6%) of people with electricity, so the municipality can never have more than enough electricity. Lack of access to electricity for all is amongst the district needs that need to be addressed. This project will help ensure that such needs are met. (PkSDGDS) – 2006-2016, page 150).
  - Government is considering the best way to mobilise industrial development around an ambitious solar park concept, which is planned for deployment in the Northern Cape in the coming years, primarily because of the intense solar radiation in this province. The prefeasibility study indicates that the project could theoretically generate 5 000 MW from solar energy. Once completed, the solar park is expected to provide as much power as one large coal-fired power station. (Page 54 of GG # 40445 - 25 November 2016)

2.5.14. impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and

Refer to Heritage Impact Assessment report (Appendix F Annexure B)

2.5.15. in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?

- Within the district, Emthanjeni Municipality has the highest number (92.6%) of people with electricity, so the municipality can never have more than enough electricity. Lack of access to electricity for all is amongst the district needs that need to be addressed. This project will help ensure that such needs are met. (PkSDGDS) – 2006-2016, page 150).
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2.6. How were a risk-averse and cautious approach applied in terms of socio-economic impacts?

Refer to Appendix F Annexure F (Social Impact Assessment Report).

2.6.1. What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?

Refer to Impact Assessment (Appendix E Annexure A), where each aspect of the proposed project lists the gaps, uncertainties and assumptions associated with the project.

2.6.2. What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?

Refer to Appendix F Annexure F (Social Impact Assessment Report).

2.6.3. Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?

The activities associated with the project were identified, before their impacts could be predicted. Safety nets were considered to capture those elements that were unidentified. Finally, mitigations were sought and tailored to counteract the project-specific impacts and achieve particular goals and objectives in line with environmental best practices. Finally, an Environmental Management Programme (Appendix G) was formulated to help minimise and/or avoid any risks that might occur.

2.7. How will the socio-economic impacts be resulting from this development impact on people's environmental right in terms following:

- The area has an unemployment rate of 26% (Census 2001 data) and the site is marginal for profitable agricultural activities. The proposed project would create a relatively large number of temporary and permanent (over the lifespan of the project) employment opportunities for the local De Aar/Hanover communities. The area around De Aar has also been identified as a Renewable Energy Hub in the ELM IDP (Page 42, FEIR by CCA Environmental(Pty)Ltd for Business Venture Investments 1421 (Pty) Ltd, August 2012).;.
- In the Northern Cape Province, exceptionally high radiation levels make the province particularly suited for power generation from solar energy. Besides solar, the province also has potential for Wind, Hydro and Biomass power generation.

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- The Northern Cape Provincial Spatial Development Framework (2012) specifically recognises the potential for solar development in the province,identified with the introduction of a solar corridor stretching between ZFMgcawu and the Pixley ka Seme regions and the solar-themed specialeconomic zone (SEZ) in Khara Hais Municipality.
- In 2014, the Renewable Energy Centre of Excellence (RECE) launched in the Northern Cape42. It serves as a platform for innovation and skills development in the renewable energy sector and focuses on unlocking potential and attracting investment.
- The province intends to become a net producer of RE to the rest of the country by 2020, inviting investment and development into the province (Page 56 of the State of Renewable Energy in SA, 2015).
- Within the district, Emthanjeni Municipality has the highest number (92.6%) of people with electricity, so the municipality can never have more than enough electricity. Lack of access to electricity for all is amongst the district needs that need to be addressed. This project will help ensure that such needs are met. (PkSDGDS) – 2006-2016, page 150).
- Government is considering the best way to mobilise industrial development around an ambitious solar park concept, which is planned for deployment in the Northern Cape in the coming years, primarily because of the intense solar radiation in this province. The prefeasibility study indicates that the project could theoretically generate 5 000 MW from solar energy. Once completed, the solar park is expected to provide as much power as one large coal-fired power station. (Page 54 of GG # 40445 - 25 November 2016)
- The Municipality has agreed on seven (7) Strategic Objectives (STO) that are to be achieved;

1. Provision of access to all basic services rendered to residents within the available resources.
2. Development and transformation of the institution with the aim of capacitating the municipality in meeting their objectives.
3. Promote the equitable creation and distribution of wealth in Emthanjeni Municipal area.
4. Maintaining a financially sustainable and viable Municipality.
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6. Contribute to the creation of communities where residents and visitors can work, live and play without threat to themselves or their properties.
7. Contribute to the development and protection of the rights and needs of all residents with a particular focus on the poor.

- The project outcomes align with the national, local and regional planning objectives in terms of economic development and sustainability. The project will use a natural, renewable resource and assist with decreasing the country's reliance on coal as a source of energy. The project will not affect the environmental rights of any of the affected stakeholder groups and no-one's livelihoods will be affected in a negative manner. The project will contribute to livelihood strategies of stakeholders in the area – directly through job creation and secondary economic opportunities, and indirectly through enterprise and socio-economic development by means of a community trust. Should the mitigation measures be implemented as recommended, the contribution to long-term sustainable outcomes will be significant. The project will complement the socio-economic benefits in the area. Given the rural setting of the site there will be a need to transport goods and people over a distance, but the negative impact of this aspect can be mitigated by the secondary

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economic opportunities that the need for transport service providers will create. There are vulnerable people that will be affected by the project. The vulnerable groups include the poor and unemployed people in the urban areas, and the farm workers in the rural areas. In terms of participation a non-technical background information document aimed at these groups were produced and presented in Afrikaans, which is the dominant language in the area, and English. The project offers opportunities for semi- and unskilled labourers, which will ensure that the vulnerable groups are not excluded from economic opportunities. Mitigation measures on how to enhance these opportunities are suggested in the report. The mitigation measures include aspects such as gender equality. The project will not result in any unfair discrimination or affect the social and environmental rights of any of the stakeholder groups, should the mitigation measures be implemented as suggested. From a social perspective, the positive impact that the project will have on the affected environment outweighs the negative impacts by far, and where there are negative impacts, it can be mitigated (Social Impact Assessment Report by Equispectives Research & Consulting Services, March 2017)

2.7.1. Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?

Refer to Appendix F Annexure F (Social Impact Assessment Report).

2.7.2. Positive impacts. What measures were taken to enhance positive impacts?

Specialist studies (Appendix F, for the reports) were undertaken and an Environmental Management Programme (Appendix G) was formulated.

2.8. Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socio-economic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?

Refer to Appendix F Annexure F (Social Impact Assessment Report).

2.9. What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?

A social impact study was undertaken. Refer to Appendix F Annexure F (Social Impact Assessment Report).

2.10. What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)?

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Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?

A social impact study was undertaken. Refer to Appendix F Annexure F (Social Impact Assessment Report).

2.11. What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?

A social impact study was undertaken. Refer to Appendix F Annexure F (Social Impact Assessment Report).

2.12. What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?

Specialist studies (Appendix F, for the reports) were undertaken and an Environmental Management Programme (Appendix G) was formulated.

2.13. What measures were taken to:
2.13.1. ensure the participation of all interested and affected parties,

Please refer to Public the Participation Process in Section H (ii).

2.13.2. provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation,

Please refer to Public the Participation Process in Section H (ii).

2.13.3. ensure participation by vulnerable and disadvantaged persons

Please refer to Public the Participation Process in Section H (ii).

2.13.4. promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means,

Please refer to Public the Participation Process in Section H (ii).

2.13.5. ensure openness and transparency, and access to information in terms of the process

Please refer to Public the Participation Process in Section H (ii).

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2.13.6. ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge, and

Please refer to Public the Participation Process in Section H (ii).

2.13.7. ensure that the vital role of women and youth in environmental management and development were recognized and their full participation therein were be promoted?

Refer to Appendix F Annexure F (Social Impact Assessment Report).

2.14. Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?

Refer to Appendix F Annexure F (Social Impact Assessment Report).

2.15. What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?

Refer to Appendix F Annexure F (Social Impact Assessment Report).

2.16. Describe how the development will impact on job creation in terms of, amongst other aspects:

2.16.1. the number of temporary versus permanent jobs that will be created,

Refer to Appendix F Annexure F (Social Impact Assessment Report).

2.16.2. whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area),

Refer to Appendix F Annexure F (Social Impact Assessment Report).

2.16.3. the distance from where laborer's will have to travel,

Refer to Appendix F Annexure F (Social Impact Assessment Report).

2.16.4. the location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits), and

Refer to Appendix F Annexure F (Social Impact Assessment Report).
2.16.5. the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.).

Refer to Appendix F Annexure F (Social Impact Assessment Report).

2.17. What measures were taken to ensure:
2.17.1. that there were intergovernmental coordination and harmonization of policies, legislation and actions relating to the environment, and

Please refer to Section E for the list of environmental legislation and policies that was considered and used for the formulation of the main report and the appendices.

2.17.2. that actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?

A social impact study was undertaken, Refer to Appendix F Annexure F and a public meeting is going to be held.

2.18. What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?

An impact assessment that shows that almost all identified impacts can be affectively mitigated was undertaken, indicating that the cumulative impact effect will also be mitigated, was undertaken. Additional impacts and quantification of cumulative impacts were assessed by the following appointed specialists:

- Terrestrial Ecology, specifically the impacts on the existing wetlands condition and associated fauna and flora;
- Grazing capacity determination and soil mapping;
- Wetland Assessment;
- Visual Impact;
- Social Impact;
- Heritage Impact;
- Geo-technical; and
- Traffic Study.

(Refer to Appendix E&F)

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2.19. Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?

The mitigation measures proposed are realistic, ensured proper rehabilitation will leave no environmental legacy and managed burden, besides the loss of jobs to those that will have secured long-term employment.

2.20. What measures were taken to ensure that he costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution,
environmental damage or adverse health effects will be paid for by those responsible for harming the environment?

The Impact Assessment (Appendix E Annexure A) and Environmental Management Programme (Appendix G) were formulated to cover ways and means of ensuring that all the stakeholders (applicant, contractor & ECO) have roles to play in combating pollution during all the phases (from planning through to decommissioning).

2.21. Considering the need to secure ecological integrity and a healthy bio-physical environment, describe
how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?

Please refer to the alternative types within Section H.

2.22. Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?

- Please refer to the Social Impact Assessment Report on Appendix F Annexure F.

The general meaning of need and desirability refers to time and place, respectively, i.e. is this the right time and is it the right place for locating the proposed activity. The need and desirability of this application was addressed separately and in detail by answering *inter alia* the following questions:

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SECTION G: A MOTIVATION FOR THE PREFERRED FOOTPRINT WITHIN THE APPROVED SITE AS CONTEMPLATED IN THE ACCEPTED SCOPING REPORT;

Based on the findings of the feasibility study conducted within the Grid Solution Assessment determined development footprint alternative PV01 & PV02 the most economical due to proximity to existing Eskom infrastructure and distance from Hydra substation.

However, the EIA phase provided the findings of appointed specialists within the scoping phase furnishing insight into the preferred development footprint from a physical, geographical, biological, cultural and socio-economic perspective.

To narrow down the preferred alternative, all the specialists GIS shapefile information have been overlaid, combining all the sensitive information into a consolidated "no-go" area map shown below in **Figure 4.**

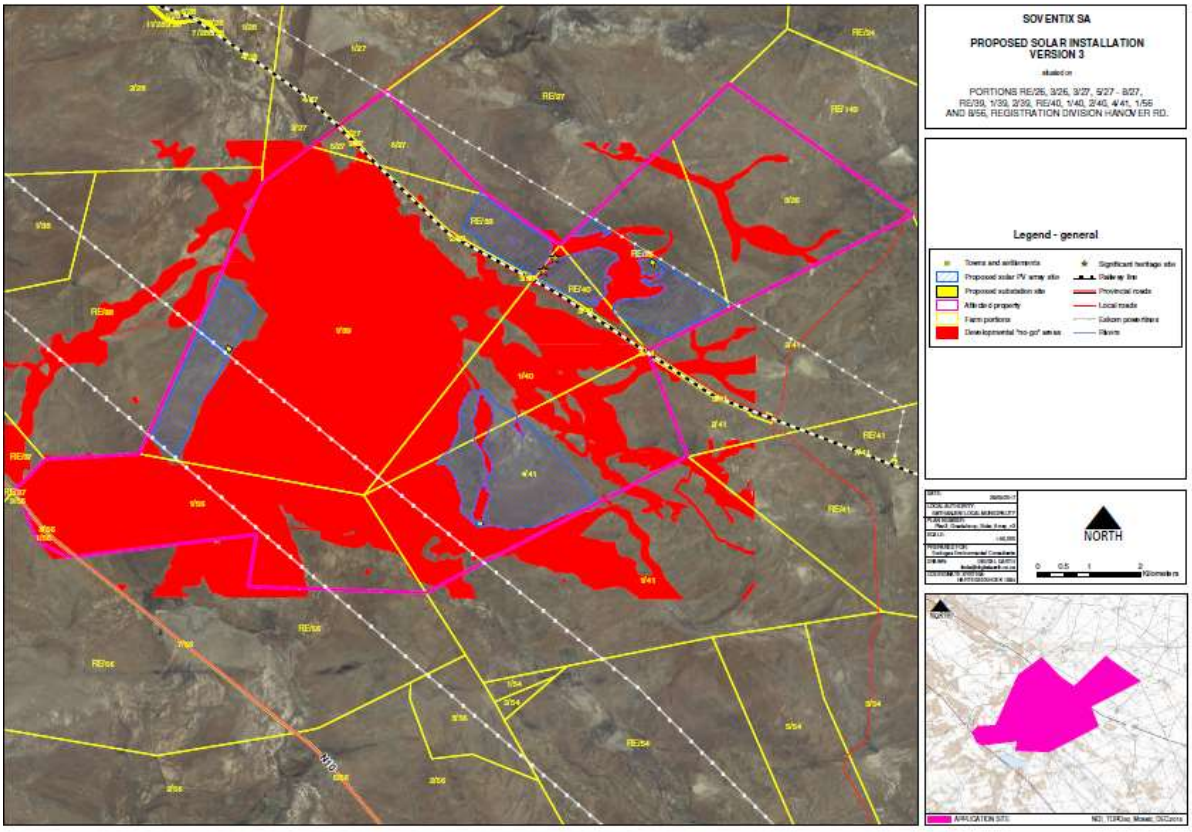

Figure 4. The alternative development footprints amended to reflect no-go sensitive areas.

The outcome of this revealed the original proposed footprints are no longer capable of supporting the full 225MW plant as they have shrunk, even halved in certain situations (Alt 1 = 194ha, Alt 2 = 373ha, Alt 3 = 345ha). This then required the assessment to focus on two options;

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1. Link the remaining extents of either alternatives to meet the minimum surface area requirements, or
2. Expand the footprints into "acceptable" (low sensitivity) areas to allow for a consolidated footprint capable of hosting the full 225MW (approximately 510ha required).

Following project management meeting's, it was decided that a consolidated footprint would be preferable, this decision was taken from an impact management perspective and for logistical and financial reasons.

The next step was to expand the development footprint alternatives to avoid these sensitive areas and identified no go areas. These redefined and expanded footprints into less sensitive areas are shown in figure 6 below.

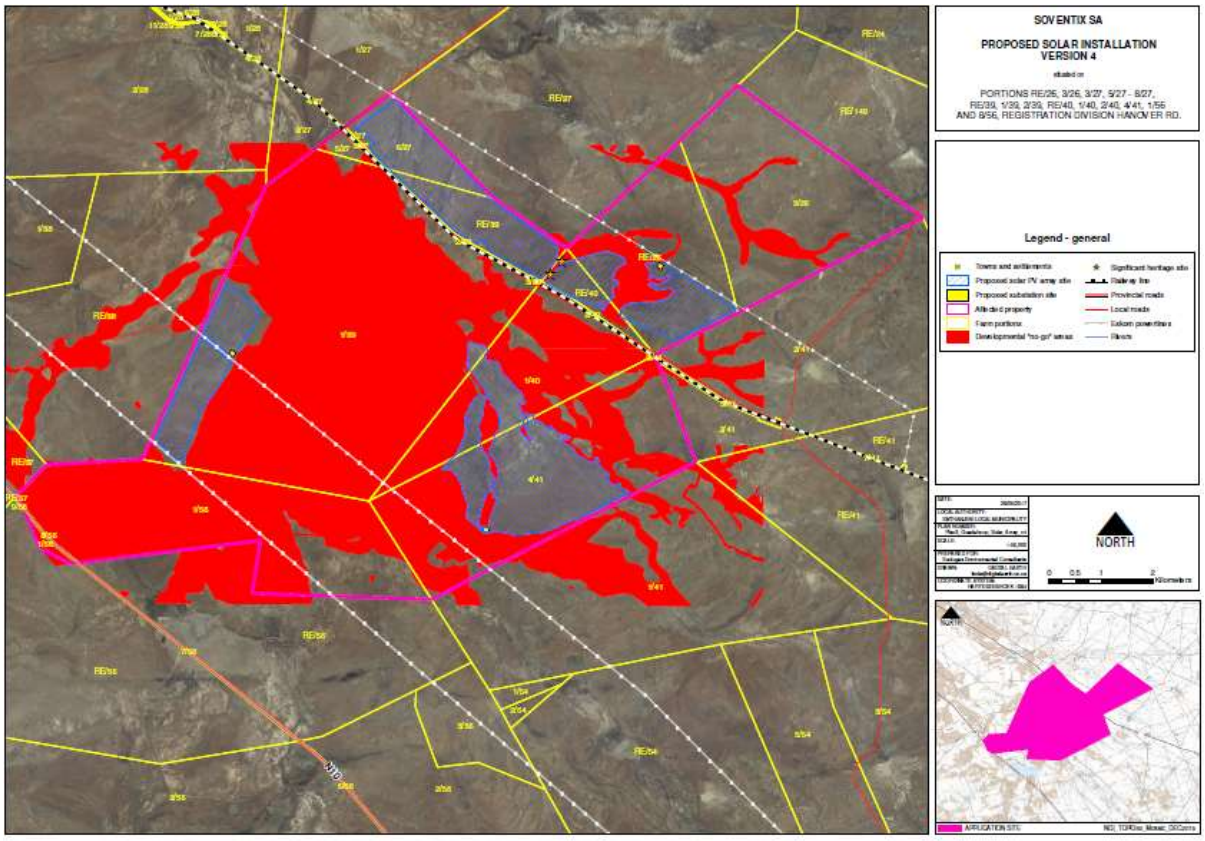

Figure 5. The amended proposed development footprint alternatives.

The newly amended alternative footprints have provided the motivation for the preferred alternative, which is summarised below;

Alternative 1

Since there is a Critical Biodiversity Area (CBA) within the original footprint, it has been significantly reduced. The ability to expand the footprint into the adjacent approved site have been restricted due to sensitive areas and geotechnical aspects including shallow dolerite sills. This alternative has a fatal flaw as a preferred option as it cannot accommodate the 225MWac PV Plant.

Alternative 2

The amended PV02 footprint can accommodate the PV plant, during the assessment process involving cumulative impacts from a physical, geographical, biological and cultural this alternative had the lowest negative weighting compared to alternative footprint 3. This provided the motivation as the preferred alternative. The required powerline pylon between the PV solar plant substation to the existing Eskom 400 kV powerline is outside the 1:100 flood line of the unnamed tributary of the Brak River catchment.

Alternative 3

The amended PV03 footprint can accommodate the PV plant, however during the assessment process involving cumulative impacts from a physical, geographical, biological and cultural this alternative had a higher negative weighting compared to alternative footprint 2. In addition, to link this development footprint to the Hydra Power Station, it would require a 30km powerline as there is not enough capacity on the 300kv line. This is not part of the scope of this EIA, however for potential future expansions of the PV plant, this alternative 3 footprints could be linked to alternative 2 via the existing 400kv line.
The feasibility of alternative 3 has fatal flaws currently on technical aspects due the required additional infrastructure and the current limited capacity of Hydra Power Station.

In summary, following the combination of the development footprint selection matrix exercise, impact assessment and cumulative impact assessment using the specialist findings, Interested and affected parties' comments and the EAP judgement, has provided the motivation for alternative development footprint 02. As this preferred alternative had the least negative weighting score when compared to alternatives 01 & 03.

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SECTION H: DESCRIPTION OF PROCESS TO REACH THE PROPOSED DEVELOPMENT FOOTPRINT WITHIN THE APPROVED SITE AS CONTEMPLATED IN THE ACCEPTED SCOPING REPORT;

(h) a full description of the process followed to reach the proposed development footprint within the approved site; including

Details of the Alternatives Considered

(i) Details of all the development footprint alternatives considered;

Legislative background

The very consideration of a development in terms of EIA is about the consideration of alternatives related to the development. The NEMA prescribes that all environmental impact assessments, which are to be utilised in informing an application for environmental authorisation, must identify and investigate the alternatives to the activity on the environment and include a description and comparative assessment of the advantages and disadvantages that the proposed activity and feasible and reasonable alternatives will have on the environment and on the community, that may be affected by the activity. If, however, after having identified and investigated alternatives, no feasible and reasonable alternatives exist, no comparative assessment of alternatives, beyond the comparative assessment of the preferred alternative and the option of not implementing the proposed project, is required during the assessment phase. In this instance, the EAP managing the application must provide the competent authority/DEA with detailed, written proof of the investigation(s) undertaken and motivation indicating that no reasonable or feasible alternatives, other than the preferred alternative and the no-go option, exist.

Definition of Alternatives

"Alternatives", in relation to a proposed activity, means different ways of meeting the general purposes and requirements of the activity, which may include the following types of alternatives:

- The property on which, or location where, it is proposed to undertake the activity;
  - Refers to both alternative properties (locations) as well as alternative sites on the same property.
- The type of activity to be undertaken;
  - Provision of public transport rather than increasing the capacity of roads.
- The design or layout of the activity;
  - Different architectural and or engineering designs.
  - Consideration of different spatial configurations of an activity on a particular site (Site Layout).

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- The technology to be used in the activity;
  - Option of achieving the same goal by using a different method or process.
- The operational aspects of the activity;
- Demand;
  - When a demand for a certain product or service can be met by some alternative means, i.e. the demand for electricity/storm water controls could be met by supplying more energy or using energy more efficiently by managing demand.
- Input;
  - Input alternatives for projects that may use different raw materials or energy sources in their processes.
- Routing;
  - Alternative routes generally apply to linear developments (pipeline routes).
- Scheduling and Timing;
  - Where a number of measures might play a part in an overall programme, but the order in which they are scheduled will contribute to the overall effectiveness of the end result.
- Scale and Magnitude;
  - Activities that can be broken down into smaller units and can be undertaken on different scales, i.e. for a housing development there could be the option 10, 15 or 20 housing units.
- The option of not implementing the activity (no-go option).
  - The no-go option is taken to be the existing rights on the property and this includes all the duty of care and other legal responsibilities that apply to the owner of the property. All the applicable permits must be in place for a land use to be an existing right.

The key criteria when identifying and investigating alternatives are that they should be "feasible" and "reasonable". The "feasibility" and "reasonability" of and the need for alternatives must be determined by considering, *inter alia*, (a) the general purpose and requirements of the activity, (b) need and desirability, (c) opportunity costs, (d) the need to avoid negative impact altogether, (e) the need to minimise unavoidable negative impacts, (f) the need to maximise benefits, and (g) the need for equitable distributional consequences. The (development) alternatives must be socially, environmentally and economically sustainable. They must also aim to address the key significant impacts of the proposed development by maximising benefits and avoiding or minimising the negative impacts.

Given the aforementioned definition and description of alternatives, alternatives for investigation in this assessment were first identified by considering whether the different types of alternatives could meet the general purposes and requirements of a solar electricity generating facility, and subsequently constitute a comparable activity. Thereafter, the need for an alternative was assessed to determine whether it warranted further investigation. Given the core business of the project proponent (Solar PV

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Systems) other technology alternatives could not be considered as legitimate alternatives for comparable assessment. Consequently, only alternatives that address site-specific impacts were considered throughout the assessment process, and mitigation(s) proposed.

Purpose and requirements of the PV solar plant

The purpose of the New PV Solar Plant is to address one of the Emthaneni Local Municipality (ELM) priority issues in respect of service (Electricity Generation/Demand) delivery. The (**IDP (Final) 2012/13 – 2015/16 Nkangala District Municipality**), lists a number of industrial and manufacturing projects that form part of the larger strategy for the economic development of the municipality. One of these projects includes the establishment of De Aar as a Renewable Energy Hub. Basic service delivery, with energy as one of the priority issues, micro- and macro-economic development, as well as land use management have been highlighted as key performance areas to be addressed within the ELM. The establishment of the proposed project has the potential to support a number of key strategies in the ELM IDP.

The investment in renewable energy and energy efficiency is considered important to reduce the negative economic, social and environmental impacts of energy production and consumption in South Africa (Winkler, 2006). Many renewable energy projects are particularly well suited to off-grid applications and, certainly in South Africa, could improve the flexibility of the grid by distributing generation across the country, closer to some key loads (Winkler, 2006).

Locally, the establishment of the proposed project would strengthen the existing electricity grid for the area, providing power in a short space of time (potentially less than two years to commissioning). Should the proposed project be approved it would result in long-term benefits for the De Aar area, e.g. creation of employment and business opportunities.

The requirement for the successful establishment of a Solar PV plant does include, inter alia, proximity to existing Eskom infrastructure to feed electricity into the grid.

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Identification and investigation of alternatives including motivations

Alternative Type No. 1: Site and Location

- Purpose and Requirements

The proposed solar electricity generating facility intends to accommodate a photovoltaic (PV) component and associated infrastructure. The solar panels arranged in units generating capacity of 225MW to be constructed as three separate but integrated facilities of 75 MW each. An on-site sub substation per facility will be necessary to supply the electricity generated through a loop-in loop-out into the adjacent 132 or 400 kV Eskom network.

The solar PV facilities combined have a maximum export capacity (MEC) of 255MW (three 75MW facilities are proposed). Several potential locations have been considered by the proponent, but the current location under review has been identified as preferred. Three (3) alternative sites within the property location have been identified in consultation with the EAP, Client and Landowner and must be assessed to ensure the preferred site does not result in unacceptable biodiversity impact relative to the alternatives.

The current land use is sheep farming and incidental game occurrence, which will continue within the solar PV plants to ensure minimal reduction (if any) on agricultural potential of the land as well as a management tool to control vegetation growth.

- Methodology

The project proponent (Soventix SA) has undertaken an extensive feasibility study throughout the Northern Cape to identify the best locations to develop Solar PV systems. The area chosen has included landowner consultation and proximity of appropriate Eskom infrastructure. The reason for the study area being concentrated within the Northern Cape is due to the high quality of solar irradiation of the region.

The proposed placement of the solar arrays was initially based on the following technical and topography criteria:

- Horizons;
- Gradient;
- Slope orientation;
- Accessibility; and
- Existing infrastructure (e.g. roads, power lines, substations)

The local study area is detailed within the grid assessment and Grid Solution Opinion report (**Appendix C**) for the Soventix SA William Retief solar PV facilities near the town of De Aar. The project site is located approximately 36km south east of De Aar, and near Hydra MTS.

The investigation included an initial spatial analysis using GIS and desk top study, followed by ground truthing with a site visit to determine the sensitive receptors and local infrastructure. The site selection of the preferred location also considered the proximity of the N10 and other provincial roads and the important tie into the Eskom 132 kV or 400 kV power lines and their capacity to receive the additional

electricity generation. The preferred property and site alternatives within that property have considered the avoidance of rocky outcrops and natural drainage channels including wetlands and watercourses. The sites were selected based on high irradiation levels, buy-in from the landowner and proximity to the Eskom power lines and local substations.

During the scoping phase, these criteria were used to provide three feasible site footprints including the preferred site and two alternative sites. These three (3) site footprints are show on the attached site / property map (**Appendix A**) and considered for the proposed development of 225MW via three (3) integrated 75 MW solar PV plants. The investigation included an identification of sensitive receptors to help position the development footprint that was determined by the EAP and specialist inputs.

The grid assessment and Grid Solution Opinion report will be discussed further below, including the site selection matrix to assess site location alternatives.

- Criteria used to investigate and assess alternatives

Initially the general area for the proposed Solar PV plant was determined by the fact that the area of the Northern Cape around De Aar is one of the regions with the highest solar irradiation intensity in South Africa. The three (3) alternative sites for the solar arrays was then based on the following technical and topography criteria:

- Quality of solar irradiation;
- Horizons;
- Gradient;
- Slope orientation;
- Accessibility;
- Existing infrastructure (e.g. roads, power lines, substations); and

The grid assessment and Grid Solution Opinion took into account the following criteria to determine the most feasible location at a local scale:

- Proximity to Eskom infrastructure including sub stations and power line crossings; and
- Landowner agreements.

- Reasoned explanation why an alternative was or was not found to be reasonable or feasible

The project property site was chosen since it achieves all the criteria highlighted above to accomplish a successful Solar PV plant. However, the assessment of alternative locations within that property was linked to the most feasible tie into existing Eskom infrastructure and the capacity of local Eskom main transmission substations, and lowest deemed environmental sensitivity.

Due to the existing Eskom, electrical infrastructure surrounding the project site, a number of grid connection options are feasible. The options explored are a 132Kv direct connection to Hydra MTS (Option 1), a 132kV overhead line loop-in loop-out of an existing 132kV overhead line between Bletterman and Taaibos substation (Option 2), and lastly a 400kV overhead line loop-in loop-out of one of the existing 400Kv overhead lines between Hydra MTS and Poseidon MTS (Option 3).

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Based on technical feasibility and cost the preferred grid connection is option 1. However, option 1 would require transformation capacity to be added to Hydra MTS beyond 2019, due to the significant interest shown in the area. This option is the most suited only if a single project is awarded "Preferred Bidder" status in the REIPPPP. Furthermore, this option would require a 30km overhead line to be installed from the project area to Hydra MTS, the environmental impact of which falls outside the scope of this EIA and would need to be assessed independently.

The Eskom Hydra Main Transmission Substation (MTS) currently does have transformation capacity constraints; and therefore, based on the interest shown in the De Aar area, particularly in close proximity to Hydra MTS, transformation upgrades will be required for projects beyond Bid Window 4 wanting to connect to Hydra MTS.

Option 3 (sites 1 & 2 (western most footprints) as per layout plan) are deemed the most practicable, when cost and logistics are combined, with a constraint being that they are only financially feasible if all three 75MW arrays are implemented.

Development footprint selection matrix during EIA phase.

The Environmental Scoping Study identified the potential positive and negative environmental (biophysical and social) impacts associated with the proposed establishment of a Solar PV Plant and associated infrastructure. Several issues for consideration were identified by the EAP and appointed Specialists during the scoping process. This environmental assessment phase has built on the foundations of the scoping process and investigated in greater depth to predict the extent and magnitude of impacts and determine their significance of each of the development footprint alternatives. This assessment will take into consideration of mitigating measures within the draft EMPr, reviewing the actions taken to prevent, avoid or minimise actual or potential adverse effects of the project. Including the option of not implementing the activity.

The EAP's assessment has taken into consideration the specialist findings and I&AP's comments to include in the impact assessment process that has provided the cumulative impacts of the proposed activity within a spatial reference to determine the recommended development footprint

This matrix serves to outline the specialist findings and recommendations utilised to evaluate the alternative development footprints and select a preferred footprint for the proposed Solar PV Plant. This decision will consider the sensitivity of the footprint from a geographical, physical, biological, social, economic, heritage and cultural aspects and the constraints of linking the proposed PV plant into the existing Eskom electricity generation infrastructure.

Please refer to the development footprint Selection Matrix below.

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Table 8: Development Footprint Selection Matrix

Scoring Index

1 = Low Impact	Ideal site for development, or *positive* impact	**2 = Low-Medium Impact**	Preferred (impact of low or negligible significance - *negative*)	**3 = Medium Impact**	Acceptable (impact of moderate significance - *negative*)	**4 = Medium-High Impact**	Not preferred (impact of high significance - *negative*)	**5 = High Impact**	Not suitable for development (impact of very high significance - *negative*)

Criteria	**Alternative Development Footprint Sites (Including Pre- and Post-mitigation)**					
	PV01 (West)		**PV02 (Central-South)**		**PV03 (North East)**	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**
Topography (Geotechnical)						
Gradients & Slope (i.e. Flat or steep)	**4**	**3**	**3**	**2**	**3**	**2**
	Pronounced Topography, steep ridge		Denuded topography		Denuded topography	
Soil Depth	**4**	**3**	**3**	**2**	**3**	**2**
	Very shallow soils Rooting depth 15cm		Significant area of Calcareous Soils Rooting depth 20 cm		Very shallow soils Rooting depth 20 cm	

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Drainage (i.e potential for soil erosion)	**3**	**2**	**4**	**2**	**3**	**2**
	There are no significant wetlands present No concentrated drainage lines.		A small southern portion area 2 that overlaps with the edge of the floodplain. Drainage sheet flow	Amend footprint to remove floodplain. The potential power pylon would be outside the 1:100 flood line of tributary of the Brak River catchment.	There are no significant wetlands present	
Sensitive Receptors (Heritage, Wetlands)						
Hydrology: Wetlands, Water resources & Flood plains	**3**	**2**	**4**	**2**	**3**	**2**
	There are no significant wetlands present	Hydrological Specialist findings for potential impacts on water quality of tributary of the Brak River to be	A small southern portion area 2 that overlaps with the edge of the floodplain.	Move footprint out of flood plain. Hydrological Specialist findings for potential impacts on	There are no significant wetlands present Number of short drainage channels to	Hydrological Specialist findings for potential impacts on water quality of tributary of the Brak

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		low and no impact on catchment yield (Quantity).		water quality of tributary of the Brak River to be low and no impact on catchment yield (Quantity).	south westwards towards the non-perennial Brak River.	River to be low and no impact on catchment yield (Quantity).
Veld condition	**4**	**3**	**4**	**3**	**3**	**2**
	Good 0% Intermediate 87.9% Poor 12.1%		Veld Condition Good 10.8 % Intermediate 59.4% Poor 29.8%		Veld Condition Good 82% Intermediate 18% Poor 0%	
Visibility within 10km offsets	**4**	**3**	**3**	**2**	**4**	**3**
	Suitable if constraints on 2		Lowest visual impact of alternatives		Suitable if constraints on 2	
Heritage and Paleontology features	**3**	**2**	**3**	**2**	**4**	**3**
	1 site on footprint boundary		5 sites close to footprint boundary		7 sites **on** footprint	

Biodiversity Sensitivity (Ecological)						
Protected Flora	**5**	**4**	**4**	**2**	**3**	**2**
	Critical Flaw Critical Biodiversity Area (CBA) Sensitive dolerite ridges and outcrops	Removing CBA area makes footprint too small to accommodate PV plant.	Large areas of grassy shrubland		Smallest area of medium high sensitivity	
Protected Fauna	**5**	**4**	**3**	**2**	**3**	**2**
	Critical Flaw Critical Biodiversity Area (CBA Sensitive dolerite ridges and outcrops)	Removing CBA area makes footprint too small to accommodate PV plant.	Large areas of grassy shrubland		Smallest area of medium high sensitivity	
Existing Infrastructure (Roads, Eskom Sub stations)						
Accessibility (Roads) & Traffic Management	**3**	**2**	**4**	**3**	**4**	**3**
	Site 1 with proximity to N10 may be a positive impact, however	SANRAL Approval	A&P's noted concern over dust if main access is from farm roads.		A&P's noted concern over dust if main access is from farm roads.	

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	SANRAL approval required.					
Eskom Sub Station	**3**	**2**	**3**	**2**	**5**	**4**
	Option 3 of grid assessment preferred to loop into 400kV linking Hydra MTS meaning PV 1 & 2 feasible		Option 3 of grid assessment preferred to loop into 400kV linking Hydra MTS meaning PV 1 & 2 feasible		**Critical Flaw** Would require a 30km overhead line which is out of the scope of this EIA.	
Eskom Powerlines	**3**	**2**	**3**	**2**	**5**	**4**
	Proximity to 400kV provides feasibility of option 3 of grid assessment		Proximity to 400kV provides feasibility of option 3 of grid assessment		**Critical Flaw** Would require a 30km overhead line which is out of the scope of this EIA	
Cost	**2**	**1**	**2**	**1**	**3**	**2**
	More		More		High costs	

	economical at present to link to Hydra MTS		economical at present to link to Hydra MTS		to link to Hydra MTS due to limited capacity on 132kv line	
Security	**3**	**2**	**3**	**2**	**3**	**2**
	No significant difference in security between the 3 footprints		No significant difference in security between the 3 footprints		No significant difference in security between the 3 footprints	
Economic & Population (Social)						
Employment	**2**	**1**	**2**	**1**	**2**	**1**
	No significant difference between 3 alternative footprints	Positive impact	No significant difference between 3 alternative footprints	Positive impact	No significant difference between 3 alternative footprints	Positive impact
Sustainable Development	**3**	**2**	**3**	**2**	**3**	**2**
	No significant difference between 3 alternative		No significant difference between 3 alternative		No significant difference between 3 alternative	

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	footprints		footprints		footprints	
Land Use Compatibility						
Agriculture, Grazing	**4**	**3**	**3**	**2**	**3**	**2**
	Stocking rate of no more than 3.48 LSU/100ha		Stocking rate of no more than 5.6 LSU/100ha.		Stocking rate of no more than 5.12 LSU/100ha	
Land use	**3**	**2**	**3**	**2**	**3**	**2**
	Existing land use is sheep grazing		Existing land use is sheep grazing		Existing land use is sheep grazing	
Existing services (Water availability)	**3**	**2**	**3**	**2**	**4**	**3**
	2 x wind pump reservoirs, 2 x earth dams, 3 x concrete reservoirs and quarry water.		2 x small earth dams and 2 x small concrete reservoirs.		2 x water boreholes	
TOTALS	**60**	**45**	**60**	**38**	**63**	**45**
Impact Scoring **20-40 *Low Impact*, 40-60 *Low-Medium*, 60-80 *Medium-High Impact* & 80-100 *High Impact***	**Medium-High Impact**	**Low-Medium**	**Medium-High Impact**	**Low Impact**	**Medium-High Impact**	**Low-Medium**

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Development Footprint Alternative selection matrix Conclusion Summary

The development footprint alternative 2 has been identified as having a lower negative weighting score compared to alternatives 1 & 3.

Alternative 2 reflected as the lowest impact on the biodiversity of the area with larger areas of grassy shrubland considered low sensitivity and only a small dolerite outcrop to avoid due to the higher biodiversity value. A small area of flood plain has been removed from alternative 1 footprint. After the original alternative footprints had to be amended due to identified no-go areas for development shown in **Figure 6** below, it meant that alternative 1 footprint was reduced significantly to remove the CBA and subsequently could not be expanded to accommodate the 225MV. This became a fatal flaw and reflected in a higher negative score. Alternative 2 was also considered the lowest impact from a visual perspective compared to alternatives 1 & 3.

The social characteristics were considered similar for all three alternatives. Alternative 3 had the most heritage features to consider and the footprint altered accordingly. The geotechnical findings showed all 3 alternatives had extensive shallow soils and alternative 2 had lowest portion of dolerite dykes which can be problematic in mounting the PV panels and ground foundations.

There were technical and financial constraints as to which footprint could be considered for development. Alternative 3 currently would require a 30km powerline to Hydra Power station due to inadequate capacity on the adjacent 132kv line. This reflected in a higher negative score.

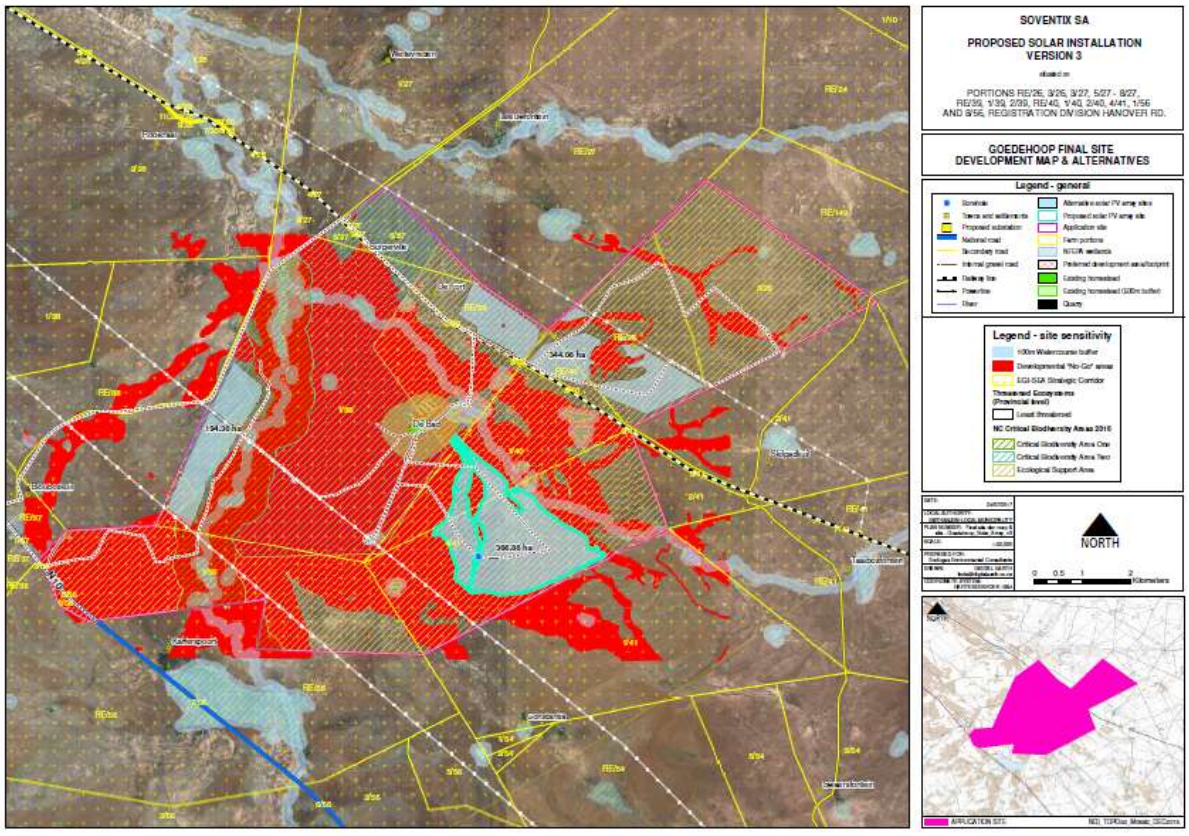

Figure 6. Development footprint alternatives and identified no-go areas.

Alternative Type No. 2: Type of Activity

- Purpose and Requirements

The purpose of the new Solar PV system, includes the establishment of De Aar as a Renewable Energy Hub, which can be achieved by providing different renewable energy options. The aforesaid Hub has to be within close proximity to existing Eskom infrastructure.

- Methodology

Several feasibility studies have been completed by various role players that have identified solar as a preferred technology for South Africa and more specifically the northern Cape. The annual 24-hour solar radiation average for South Africa is 220 W/m2, compared with 150 W/m2 for parts of the USA and about 100 W/m2 for Europe. Almost the whole of the interior of the country has an average insolation in excess of 5 000 Wh/m2/day. Some parts of the Northern Cape have an average insolation of over 6 000 Wh/m2/day (Winkler, 2006).

The Pixley ka Seme District Municipality as entrenched in their IDP, have declared themselves as a Renewable Energy Hub due to the suitability of inter alia solar technologies. Indicative of the suitability of the area for solar can be seen in the awarding of 19 of the 28 preferred bidders in the 2011 REIPPP bid award within the Pixley ka Seme District Municipality.

Investments in solar projects bring socio-economic relief to distressed communities via job creation during construction and operation. These developments help to nurture the local economy and create enterprise opportunities and social programmes.

- Criteria used to investigate and assess alternatives

Numerous reports, guideline documents and government gazettes were reviewed in order to assess the feasibility of solar PV technology as a sustainable energy generation option.

- Reasoned explanation why an alternative was or was not found to be reasonable or feasible

The core business of the project proponent is PV panel development and installation for the use in the generation of electricity. As such, the fundamental alternative of a development other than to conduct and operate a solar energy facility is therefore not viable in this case and will not be considered further in the EIA. The REFIT program is also a key project component due to the fact that the next phase includes Solar PV as an option and the project proponent will take the opportunity to submit the project proposals.

Although a different type of renewable energy technology can achieve the same purpose, there is an existing Solar PV network and the long-term environmental implications of operating and maintaining the various renewable energy systems, particularly on the receiving environment, are not known.

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Alternative Type No. 3: Design and Layout

The final layout had to be primarily determined by the Eskom infrastructure tie in choice and detailed design considerations. This layout has also been informed by the recommendations made in the specialist baseline studies completed during the EIA phase.

Alternatives in relation to layout and design considered in terms of environmentally sensitive areas especially which are to be avoided or mitigated by the proposed development, such as avoiding water courses and wetlands, flat and open areas away from rocky outcrops, facing north and reduced visual impact.

The design would include mounting panels at their lowest point 1 m high, to allow sheep grazing to continue, which helps control the build-up of phyomass and reduces the need to manually control vegetation growth.

The proposed layout has been firstly dependent on the amended development footprint alternatives based on the recommendations made in the specialist baseline studies. The layout is then dependent on physical features within those footprints for example rocky outcrops and water courses including wetlands that have purposely been excluded from the proposed plant layout. The PV01 footprint has been altered to remove the critical biodiversity area that was identified in the ecological impact assessment and PV02 footprint changed to remove the area of floodplain in the south which could be problematic in the wet season. Due to two significant heritage sites at PV03 it has required an alteration to the footprint boundary

The consideration of different spatial configurations of the activity layout on the development footprint alternatives was informed by producing no go area maps shown in **Figure 4 & 5**. These helped to produce the layout plan shown in **Figure 2** (Page 20) and in **Appendix A**. Furthermore, the findings of the GSO have impacted heavily on the technical and financial constraints as to which footprint is to be considered for development and subsequent layout plan.

Alternative Type No. 4: Technology

Refer to Activity No. 2 in respect of the type of activity.

The preferred technology for the proposed PV panels makes use of the thin film PV panels. The thin film solar panels have lower losses or in other words perform better in hot climates and higher temperatures, low radiation conditions such as in the early morning or during sunset and cloudy conditions.

Polar trackers are also being considered. This system is suitable for use with standard crystalline and thin-film modules. The tracker is oriented on a north-south axis and tracks in two dimensions only (also

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called a 'single-axis' tracker). This system increases the performance of modules by approximately 20% over a fixed configuration. This improvement is mainly experienced early and late in the day and covers more of the morning and evening electricity usage peaks.

Alternative mounting systems have been investigated. There are many ground mounted structures available based on either piled or ballast systems. Piled systems utilise a metal pile that is driven into the soil on which the main structural beam is mounted. This system is utilised extensively in Europe where soils are generally deep. An advantage of this system is the mechanisation of the process, lowering the construction costs in Europe where labour is expensive. Ballast foundations utilise a concrete or other material foundation with sufficient mass to offset wind loads. This system requires no penetration of the soil and is suitable for hard rocky soils.
Those areas of the sites not underlain by dolerite bedrock are largely underlain by soft to medium hard rock sandstone/siltstone at depths of less than 0,5 metres below ground level. Considering the time-consuming nature of pad footing construction (breaking out and removal of rock and casting of reinforced concrete), and furthermore the difficulty which rock mass at depths shallower than 1,0 m will cause to placement of screwed piles, rammed piles is considered the most effective support option for solar panels. However, since driving to at least 1 metre depth, may prove difficult over large parts of the site (where rock mass depths are < 0,5 metres), as an alternative, ground beam concrete footings (which make use of concrete strip footings at very shallow depth below ground level to act as support and counterweight for solar panels) may possibly have to be utilized. This founding option is expected to be considerably costlier than using of piles.

The tracking system mounting process is based on anchor posts cast in concrete. Round holes of a diameter up to 300mm are drilled (where possible significantly lower), 1200mm in depth, the anchor post is then placed with jigs in the hole and the hole is filled with concrete.

Following extensive consultation its thought that dolerite sills is not a constraint and in fact reduces the required size of the hole and concrete requirements.

The core business of the project proponent is PV panel development and installation for the use in the generation of electricity. As such, the fundamental alternative of a development other than to conduct and operate a solar energy facility is therefore not viable in this case and will not be considered further in the EIA.

Alternative Type No. 5: Operational Aspects

- Purpose and Requirements

The purpose of the new Solar PV system, includes the establishment of De Aar as a Renewable Energy Hub, which can be achieved by providing different renewable energy options. The aforesaid Hub must be within close proximity to existing Eskom infrastructure.

- Methodology

Operational alternatives have been considered where identified by the specialists. Additional requirements, that may be enforced by ESKOM, will need to be adhered to.

- Criteria used to investigate and assess alternatives

N/A

- Reasoned explanation why an alternative was or was not found to be reasonable or feasible

Alternative operational aspects were investigated during the EIA phase as in-depth specialist studies have been completed. On-site operational activities should clearly be guided by best labour practices in relation to optimal use of local labour, provision of a good standard workplace environment and facilities without undue or avoidable impacts on the environment. This is especially applicable concerning the use of potable water as well as good management practice for wastewater and solid waste, considering operational procedures related to disposal.

The following points were recommended for the operational phase alternatives but not exhaustive, please refer to **section K** (Summary of Specialist findings) and **Appendix F** (Specialist Reports);

Alien Plant Invasion Risk During Operation

- Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.

Soil erosion and associated degradation of ecosystems

- All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk.
- All cleared areas should be revegetated with indigenous perennial grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.

Faunal impacts during operation

- If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects.
- All vehicles accessing the site should adhere to a low speed limit (30km/h max) to avoid collisions with susceptible species such as snakes and tortoises.
- If the facility is to be fenced, then the electrified strands should be on the inside of the fence as some species such as tortoises are susceptible to electrocution from electric fences as they do not move away when electrocuted but rather adopt defensive behaviour by retreating into their shells and are killed by repeated shocks.

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Alternative No. 6: Demand

- Purpose and Requirements

The investment in renewable energy and energy efficiency is considered important to reduce the negative economic, social and environmental impacts of energy production and consumption in South Africa (Winkler, 2006). Many renewable energy projects are particularly well suited to off-grid applications and, certainly in South Africa, could improve the flexibility of the grid by distributing generation across the country, closer to some key loads (Winkler, 2006).

Methodology

This EIA forms part of the feasibility study and prerequisite by NERSA for awarding a PPA under the REFIT programme.

Criteria used to investigate and assess alternatives

N/A

Reasoned explanation why an alternative was or was not found to be reasonable or feasible

The purpose of the New PV Solar Plant is to address one of the Emthaneni Local Municipality (ELM) priority issues in respect of service (Electricity Generation/Demand) delivery. The (**IDP (Final) 2012/13 – 2015/16 Nkangala District Municipality**), lists a number of industrial and manufacturing projects that form part of the larger strategy for the economic development of the municipality. One of these projects includes the establishment of De Aar as a Renewable Energy Hub. Basic service delivery, with energy as one of the priority issues, micro- and macro-economic development, as well as land use management have been highlighted as key performance areas to be addressed within the ELM. The establishment of the proposed project has the potential to support a number of key strategies in the ELM IDP.

Alternative No. 7: Input

- Purpose and Requirements

The purpose of the new Solar PV system, includes the establishment of De Aar as a Renewable Energy Hub, which can be achieved by providing different renewable energy options. The aforesaid Hub has to be within close proximity to existing Eskom infrastructure.

Methodology

NA

Criteria used to investigate and assess alternatives

NA

Reasoned explanation why an alternative was or was not found to be reasonable or feasible

The core business of the project proponent is PV panel development and installation for the use in the generation of electricity. As such, the fundamental alternative of a development other than to conduct

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and operate a solar energy facility is therefore not viable in this case and will not be considered further in the EIA.

Although a different type of renewable energy technology can achieve the same purpose, there is an existing Solar PV network and the long-term environmental implications of operating and maintaining the various renewable energy systems, particularly on the receiving environment, are not known.

-Alternative No. 9: Scheduling and Timing

The proposed Solar PV plant will be dependent on the scheduling and timing of the REFIT program and the proposed project time frames would be coordinated to be part of the next window of REFIT phase, which includes Solar PV as the preferred type of renewable energy.

-Alternative No. 10: Scale and Magnitude

The appointed specialists have provided feedback on biophysical and social environmental aspects of the alternative locations which will in turn guide the scale and magnitude of the preferred development footprint.

The development footprints have been redefined following the findings of the appointed specialists which has meant removing areas of sensitivity and utilising less sensitive areas. The final decision on the preferred footprint depends on the feasibility of tie into the existing Eskom infrastructure and that has the least impact on the environment. The motivation for the preferred footprint is discussed in Section H (x).

-Alternative No. 11: No-go Option

The option of not implementing the activity (no-go option) was used as the benchmark against which all impacts associated with the proposed development were assessed.

The No-Go alternative relates to the option of not developing the proposed Solar PV plant and associated infrastructure (i.e. the Status Quo). If the proposed project is not developed, the current land use activities are assumed to continue in the long-term including grazing of livestock.

If the proposed activity was not to go ahead, there would be no additional impacts on the local biodiversity, hydrology, heritage resources provided the current land use remained the same as livestock grazing intensity and carrying capacity. However, the no-go option would result in a loss of positive opportunities including an increase in renewable energy source and therefore helping reduce South Africa's dependence on non-renewable fossil fuels. There would also be a lost opportunity within job creation and skills development associated with the proposed project.

The identification of the preferred development footprint alternative within the approved site, was helped determined by the site selection matrix (Page 56**).** The decision on the preferred development

footprint alternative as motivated in **section G** will be discussed further in **section J** (Cumulative Impacts) and concluded within the **section H (x)**.

Details of the Public Participation Process

(iii) details of the public participation process undertaken in terms of regulation 14 of the Regulations, including copies of the supporting documents and inputs;

(iv) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;

Regulation	Yes	No
If the proponent is not the owner or person in control of the land on which the activity is to be undertaken, the proponent must, before applying for an environmental authorisation in respect of such activity, obtain the written consent of the landowner or person in control of the land to undertake such activity on that land.	X	
Report submitted in terms of regulation 21 and the environmental impact assessment report and EMPr submitted in terms of regulation 23; was subjected to must give all potential or registered interested and affected parties, including the competent authority, a period of at least 30 days to submit comments on each of the basic assessment report, EMPr, scoping report and environmental impact assessment report, and where applicable the closure plan, as well as the report contemplated in regulation 32, if such reports or plans are submitted at different times.	X	
The public participation process contemplated in this regulation must provide access to all information that reasonably has or may have the potential to influence any decision with regard to an application unless access to that information is protected by law and must include consultation with- (a) the competent authority; (b) every State department that administers a law relating to a matter affecting the environment relevant to an application for an environmental authorisation; (c) all organs of state which have jurisdiction in respect of the activity to which the application relates; and (d) all potential, or, where relevant, registered interested and affected parties.	X	
The person conducting a public participation process must take into account any relevant guidelines applicable to public participation as contemplated in section 24J of the Act and must give notice to all potential interested and affected parties of an application or proposed application which is subjected to public participation by-	X	
(a) fixing a notice board at a place conspicuous to and accessible by the public at the boundary, on the fence or along the corridor of- (i) the site where the activity to which the application or proposed application relates is or is to be undertaken; and (ii) any alternative site;	X	
(b) giving written notice, in any of the manners provided for in section 47D of the Act, to- (i) the occupiers of the site and, if the proponent or applicant is not the owner or person in control of the site on which the activity is to be undertaken, the owner or person in control of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken; (ii) owners, persons in control of, and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is	X	

to be undertaken; (iii) the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area; (iv) the municipality which has jurisdiction in the area; (v) any organ of state having jurisdiction in respect of any aspect of the activity; and (vi) any other party as required by the competent authority;		
(c) placing an advertisement in- (i) one local newspaper; or (ii) any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations; (d) placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or district municipality in which it is or will be undertaken: Provided that this paragraph need not be complied with if an advertisement has been placed in an official Gazette referred to in paragraph (c)(ii); and (e) using reasonable alternative methods, as agreed to by the competent authority, in those instances where a person is desirous of but unable to participate in the process due to- (i) illiteracy; (ii) disability; or (iii) any other disadvantage.	X	
(3) A notice, notice board or advertisement referred.to in subregulation (2) must- (a) give details of the application or proposed application which is subjected to public participation; and (b) state- (I) whether basic assessment or S&EIR procedures are being applied to the application; (ii) the nature and location of the activity to which the application relates; (iii) where further information on the application or proposed application can be obtained; and (iv) the manner in which and the person to whom representations in respect of the application or proposed application may be made.	X	
(4) A notice board referred to in sub regulation (2) must- (a) be of a size at least 60cm by 42cm; and (b) display the required information in lettering and in a format as may be determined by the competent authority.	X	
(5) Where public participation is conducted in terms of this regulation for an application or proposed application, sub regulation (2)(a), (b), (c) and (d) need not be complied with again during the additional public participation process contemplated in regulations 19(1)(b) or 23(1)(b) or the public participation process contemplated in regulation 21(2)(d), on condition that- (a) such process has been preceded by a public participation process which included compliance with sub regulation (2)(a), (b), (c) and (d); and (b) written notice is given to registered interested and affected parties regarding where the- (I) revised basic assessment report or, EMPr or closure plan, as contemplated in	X	

regulation 19(1)(b); (ii) revised environmental impact report or EMPr as contemplated in regulation 23(1)(b); or (iii) environmental impact report and EMPr as contemplated in regulation 21(2)(d); may be obtained, the manner in which and the person to whom representations on these reports or plans may be made and the date on which such representations are due.		
(6) When complying with this regulation, the person conducting the public participation process must ensure that- (a) information containing all relevant facts in respect of the application or proposed application is made available to potential interested and affected parties; and (b) participation by potential or registered interested and affected parties is facilitated in such a manner that all potential or registered interested and affected parties are provided with a reasonable opportunity to comment on the application or proposed application.	X	

Level of Public Participation

The level of public participation was determined by taking into account the scale of the anticipated impacts of the proposed project, the sensitivity of the affected environment and the degree of controversy of the project, and the characteristics of the potentially affected parties. Based on the findings of the aforementioned consideration (**Appendix D-A:** Level of Public Participation), there was no reason to elaborate on the minimum requirements of the public participation process outlined in the EIA Regulations, 2014 or use reasonable alternative methods for people desiring of but unable to participate in the process due to illiteracy, disability or any other disadvantage.

Two Public Meetings (Appendix D: **Annexure H (1)** – Attendance Register) were held on 19th September at Multipurpose Hall (De Aar) & Kwezi Community Hall (Hanover), to provide another platform to I&APs to raise issues and gain a deeper insight into the nature of the project, through an open debate forum. The public meeting minutes are attached in Appendix D: **Annexure H (2)**.

Potentially interested and affected parties were notified of the project and proposed application by –

a. fixing a notice board at a place conspicuous to the public at the boundary or on the fence of –
    i. the site where the activity to which the application relates is or is to be undertaken; and
    ii. any alternative site mentioned in the application;

Three notice boards (**Appendix D-B:** Site notice text) advertising the applications were fixed along the property boundary on the 5th of October 2016, but due to prevailing weather conditions shortly after them being displayed, they were damaged and had to be replaced with a more robust alternative.
New notice boards were fixed along the property boundary on the 10th of January 2017. Another set of Notice Boards, that include the potential water uses, were erected on the 31st March 2017 (**Appendix D-C:** Displayed Site Notices).

Emailing Background Information Documents (BID) (**Appendix D-D:** Background Information Document (BID) text) on the 30th of September to – and sending a Notification letter via Registered mail on the 22nd February to – #

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The owner or person in control of that land if the applicant is not the owner or person in control of the land:
Willem Retief: wretief@webmail.co.za; 082 944 7167

Owners and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken:

Remainder of FARM No. 149 (Farm Goodhope)

- # Neville Vimpany, Email: cathy.vimpany@yahoo.com; Cell: 082 868 1991 or Tel: 041 366 1037

Remainder of LEUWE FOUNTAIN No. 27 (Farm: Leeuwfontein)

- # Corneulis Oosthuizen; Email: louisa.oosthuizen25@gmail.com; Cell: 061 271 0268

Portion 1,2 & 4 LEUWE FOUNTAIN No. 27 (Farm Weltevrede)

- # Pieter du Toit; Email: psdutoit4@gmail.com; Cell: 083 278 2590

Remainder of TAAIBOSCH FONTEIN No. 41 and Portion 1 (Farm: Constancia)

- # Andries Pienaar; Email: andriespienaar@hotmail.com; Cell: 082 762 2206

Portion 2 & 5 TAAIBOSCH FONTEIN No. 41 (Farm: Skilpadskuil)

- # Manual Orfao; Email: kmss@worldonline.co.za; Cell: 082 782 1972

Portion 3 of TAAIBOSCH FONTEIN No. 41

- # Dawie du Plessis; Email: lduplessis@live.com; Cell: 083 544 4139

Remainder & Portion 7 &9 of KAFFERSPOORT No. 56 (Farm:Dieprivier)

- # Andries Pienaar; Email: andriespienaar@hotmail.com; Cell: 082 762 2206

Remainder of BARENDS KUILEN No. 38 (Farm: Blaawboschkuil)

- # Christiaan Venter; Email: wortelfontein@vodamail.co.za; Cell: 082 378 3601

Remainder & Portion 1 of BLAAUWBOSCH KUILEN OUTSPAN No. 37 (Farm: Blaawboschkuil)

- # Christiaan Venter; Email: wortelfontein@vodamail.co.za; Cell: 082 378 3601

The municipal councillor of the ward in which the site or alternative site is situated and any organisation of rate payers that represent the community in the area:

- # Lena Elizabeth Andrews (Ward 6), Email: elizabethm@emthanjeni.co.za, Cell: 078 787 0420
- Mr Patrick Mhlawuli (Ward 8), no email address, Cell: 083 8829 450
- Ms Nontobeko Mkontwana (Ward 3), Email: npmkontwana@emthanjeni.co.za, Cell: 079 5583 031

The municipality which has jurisdiction in the area:

Pixley ka Seme District Municipality

- # Mr Rodney Pieterse (Municipal Manager); Email: mm@pksdm.gov.za; Tel: 053 631 0891;
- Mr Archie Staffa (PA); Email: emmanuel.staffa@gmail.com; Tel: 053 631 0891
- Mr Sonwabile Nkondefhe (Env Director); Email: pixley@telkomsa.net; Tel: 053 631 0891
- Ms Hilda Mapuleng (Town Planner); Email: hmapuleng@gmail.com; Tel: 053 631 0891

Emthanjeni Local Municipality

• # Mr Isak Visser (Municipal Manager); Email: visser@emthanjeni.co.za; Tel: 053 632 9101 • Ms Marushel Meyers (PA); Email: mmeyers@emthanjeni.co.za; Tel: 053 632 9101 • Mr Francois Paljaard (Town Planner)); Email: paljaardf@emthanjeni.co.za, Tel: 053 632 9126 • Mr Soyiso Mvandaba (LED); Email: smvandaba@emthanjeni.co.za; Cell: 071 868 0309
Any organ of state having jurisdiction in respect of any aspect of the activity: **DENC** • # Thulani Mthombeni; Email: tmthombeni@ncpg.gov.za; Cell: 072 409 2277 • # Doreen Werth; dwerth@ncpg.gov.za; 060 991 4675 • Dineo Moleko; dmoleko@ncpg.gov.za; 053 807 7467 **DWS** # Mr A. Abrahams; AbrahamsA@dwa.gov.za; 053 830 8802 **DAFF** Samkelisiwe Lubanga; SamkelisiweL@daff.gov.za; 083765 4691 # Jacoline Mans; JacolineMa@daff.gov.za; 0828082737 **DPW** Sylvia Moholo; sylvia.moholo@dpw.gov.za; 053 838 5200 # Claire Jacobs; claire.jacobs@dpw.gov.za; 053 838 5257 **DoE** # Johannes Mokobane; johannes.mokobane@energy.gov.za; 0124067804
Any other party as required by the competent authority/EAP: **SAHRA** Loaded onto SAHRIS **EWT** Head Office, ewt@ewt.org.za; 011 372 3600 Cobus Theron; cobust@ewt.org.za; 021 788 5661 # Bonnie Schumann; bonnies@ewt.org.za; 021 788 5661 **WESSA** Sandy Crake; admin@wessa.co.za; (021) 701 1397 **WWF** Lameez Bayat; lbayat@wwf.org.za; 021 657 6633
Servitude Holders: **ESKOM** Bossie Uys; uysj@eskom.co.za; 053 632 6714 Henk Wydeman; WydemaH@eskom.co.za Daan Liebenberg; LiebenDa@eskom.co.za Keketso Mbete; MbeteKC@eskom.co.za **SANRAL** # Nicole Abrahams; abrahamsn@nra.co.za; 021 957 4602 **TRANSNET** # Leonie Visagie; leonie.visagie@transnet.net; 053 838 3119 Brenda Ackerman; brenda.ackerman@transnet.net; 053 838 3082 Ronald Bosch; ronald.bosch@transnet.net; 053 838 3424 Sharon Khobotlo; sharon.khobotlo@transnet.net; 053 838 3295 Mervin Mac Donald; mervin.macdonald@transnet.net; 023 348 4379

b. placing an advertisement in –
    i. one local newspaper; or

ii. any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations
iii. one provincial newspaper or national newspaper if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or local municipality in which it is or will be undertaken

1. An advertisement (**Appendix D-F (1):** Advertisement text) was placed in a provincial newspaper, the Northern Cape Express, on the 05th of October 2016 (**Appendix D-G (1):** Proof of placed advertisement).
2. An advertisement (**Appendix D-F (2):** Advertisement text) was placed in a provincial newspaper, the Noordkaap Newspaper, on the 22nd of February 2017 (**Appendix D-G (2):** Proof of placed advertisement).

c. using reasonable alternative methods, as agreed to by the competent authority, in those instances where a person is desiring of but unable to participate in the process due to illiteracy, disability or any other disadvantage.

A simplified notification letter (Appendix D: **Annexure D**), removing unnecessary and confusing technical and legal content translated into Afrikaans, has been distributed to the occupiers of the affected properties.

In terms of regulation 55(1), all organs of state which have jurisdiction in respect of the proposed activity and all persons who submitted written comments, attended the site meeting or requested, in writing, to be registered were placed on the register (**Appendix D-H:** List of Registered Interested and Affected Parties).

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The Environmental Attributes Associated with the development footprint.

(iv) The environmental attributes associated with the development footprint alternatives focusing on geographical, physical, biological, social, economic, heritage and cultural aspects;

Geographical Aspects

De Aar is situated in the Northern Cape Province, with an approximate population of 35 539 people (census 2001). De Aar situated within the Emthanjeni Municipality, is renowned for its central location on the main railway line between Johannesburg, Cape Town, Port Elizabeth and Namibia. The Municipality is further situated in the Pixley ka Seme District Municipality with an approximate population of 164 607 people (census 2001), this represents 16, 92% of the Northern Cape population. The Municipality is also approximately 300km south west of Kimberley, 440 km south east of Upington, 300 km north east of Beaufort West and 300 km south west of Bloemfontein.

Hanover lies approximately 65 km east of De Aar on N1 main north to south route. Britstown is situated about 55 km west of De Aar on the N12 route. Both these main routes link Johannesburg and Cape Town. The towns of Emthanjeni lie in an extensive stock farming area with the emphasis on sheep, mutton and wool farming, especially Merino's. Emthanjeni Municipality, specifically De Aar, is the seat of Pixley ka Seme District Municipality; the Municipality further hosts all Government Departments. Emthanjeni Municipality covers an area of approximately 11390km². Emthanjeni comprises 11% of the district land area and 3% of the province. We further represent approximately 23% of the district's population.
(Emthanjeni Local Municipality, Integrated Development Plan 2011 – 2016).

Physical Aspects

-Climate

The climate of the study area (Koch & Kotze, 1986) can be regarded as warm to hot with a summer rainfall and dry, cold winters. Temperatures vary from an average monthly maximum and minimum of 32.6ºC and 15.4ºC for January to 16.8ºC and 0.3ºC for July, respectively. Temperature ranges are large with lows of -10°C in winter to mid-40°C in summer. The long-term average annual rainfall in this region of the Northern Cape is only 289mm, of which 201 mm (70%) falls from November to April. Frost occurs most years, 30 days on average, between late May and early September. The climatic restrictions (namely very low rainfall) means that this part of the Northern Cape is best suited for grazing, although the grazing capacity is low (approximately 20-25 ha/large stock unit) (ARC-ISCW, 2004). The only means of cultivation would be by irrigation. The region is subject to periodic droughts which have a serious impact on the surrounding farming areas and on the economy of the towns. The area has a low prevailing agricultural potential.

-Topography

The area is characterised by wide open plains with relatively flat topography typical of the Central Karoo. The site is relatively flat (average slope gradient is less than 10% from the east to the west) with

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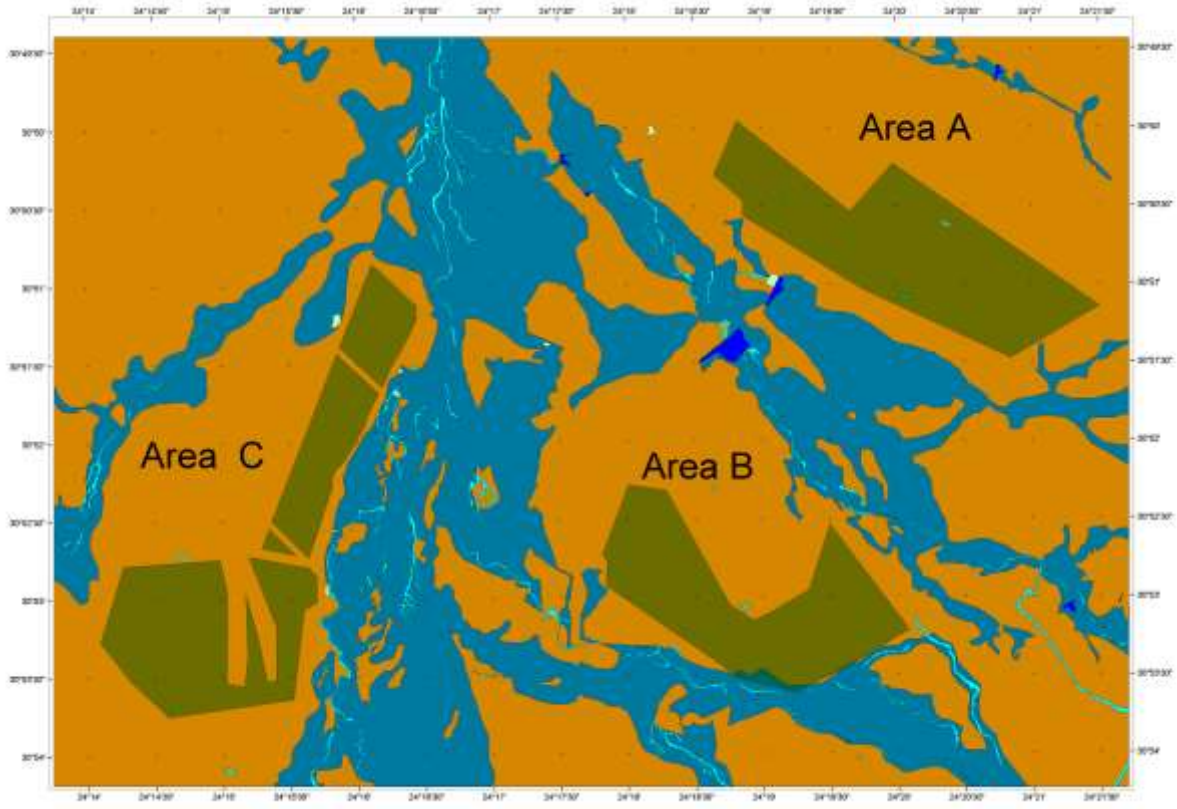
some low rocky ridges in the east and north-east of the site. There are a few shallow drainage lines present on site. The site is located at an altitude of approximately 1 300 m to 1 340 m above sea level.

There are no significant wetlands present in the three main study areas. The most conspicuous wetlands are small artificial permanent wetlands around watering points. There is no major flood danger inside the study areas except for a small southern portion of focus area B that overlaps with the edge of the floodplain. However, the adjacent flood plains are characterised by severe flooding during some rainy seasons.



Colour	No	Class
	1	Water
	2	Permanent wetland
	3	Seasonal wetland
	4	Floodplain
	5	Streambeds
	6	Non-wetland

Figure 6. Wetland map for the wider area around the three focus study areas.

-Hydrology

Catchment description

The site is located within quaternary sub-catchment D62D of the Lower Orange drainage region, as described in "Water Resources of South Africa – 2012" (WR2012) (Water Research Commission, 2012). The site is situated adjacent to an unnamed tributary of the lower reaches of the Brak River,

near De Aar in the Northern Cape Province. The drainage of the site is in a north westerly direction towards the Brak River, which eventually joins the Orange River before discharging into the Atlantic Ocean on South Africa's west coast, at the border with Namibia. The topography of the region is generally flat, characterised by wide plains and open spaces. The site where pylon is to be constructed is situated in a wide valley, where the watercourse is poorly defined.

-Geology (Bedrock and soils)

Bedrock

The bedrock of the region consists of sediments (mostly fine to medium grained sandstone, but also siltstone and mudstone) of the Adelaide Subgroup, Beaufort Group, Karoo Supergroup.

Dolerite dykes and sills both are sheet-like rock bodies intruded into the sedimentary rock. They are distinguished by their orientation relative to the sedimentary bedding [sills are orientated parallel or sub-parallel to the sedimentary bedding (thus roughly horizontal in this area), while dykes cut across the sedimentary bedding planes (and are thus roughly orientated vertical or near-vertical in this area). A number of dolerite dykes and sills of Karoo age have been intruded into the sediments on the sites. Due to the fact that the dykes are often very narrow (meter scale), they often do not have such a pronounced effect on topography as the sills which (due to a slow weathering rate for dolerite compared to sediments) form local topographical high points. Consequently, some dolerite dykes have not been included in pre-existing 1:250 000 scale geological map for the area (Le Roux, 1985). The majority of the dykes omitted on pre-existing large-scale map have been confirmed during the site visit and added to the geological map (see Figs. 2 to 4). Additionally, the location of a small number of possible dykes (not identified during the ground truthing visit but visible as linear structures on satellite images) are indicated.

Soils

Observations during the ground truthing exercise indicate that the overwhelming portions of all three sites have very shallow soils and either bedrock sub-outcrop at less than 0,5 metres depth below ground surface or bedrock outcrop (refer to observation descriptions at particular location points in Appendix I). Outcrop is particularly prevalent in areas underlain by dolerite bedrock (refer to Figures 2 to 4). The thickest soils (0,5 to 1,2 metres thickness over minor parts) occur in areas of either gully wash material deposits (short drainage channels between localities A14 and A13 on Site A) or alluvial deposits (southwestern corner and border area of site B). Furthermore, the soils are generally of a clayey sand to silty sand nature.

These results seem to generally correlate with the soils study undertaken by Van den Berg and De Wet, (2017). [They drilled 120 shallow hand augured boreholes spread over the three sites and analyses thereof shows that 79% have soils with less than 0,5 metres combined soil horizon thicknesses (above bedrock), 18% have combined soil horizon thicknesses of between 0,5 and 1,0 meters and 3% have combined soil horizon thicknesses of between 1,0 and 1,2 metres. The slightly thicker of these soils are located in low-lying areas near alluvial channels.

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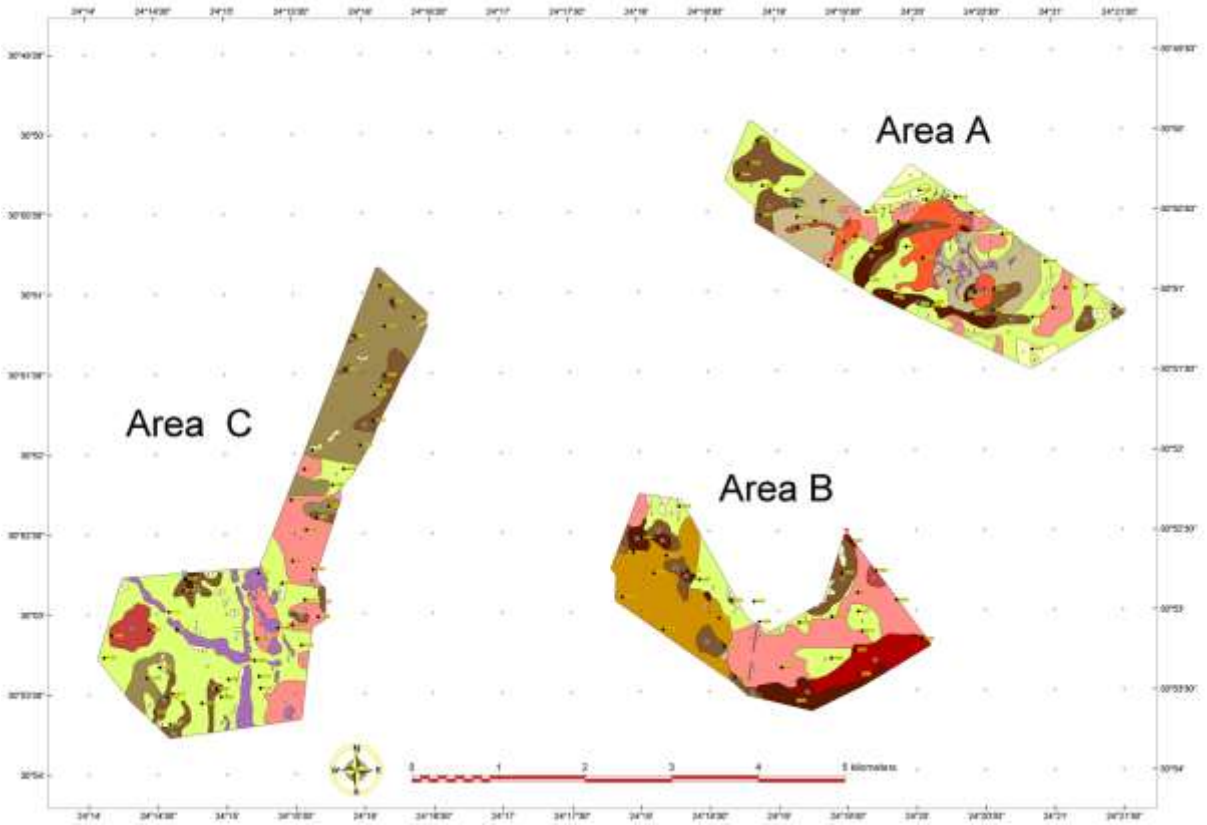

Colour	No	Class	Dominant soils
	1	Sandstone outcrops	Outcrop/Ms complex
	2	Dolerite outcrops	Outcrop
	3	Very shallow yellow brown loamy soils	Ms
	4	Very shallow yellow brown clayey soils	Ms
	5	Very shallow red loamy soils	Ms, Gs
	6	Very shallow red clayey soils	Ms, Hu, (Gs)
	7	Shallow to medium deep yellow brown loamy soils	Gs, (Ms, Cv)
	8	Shallow to medium deep yellow brown clayey soils	Oa, Ad, Ag, (Gm)
	9	Shallow to medium deep red loamy soils	Hu (Gs)
	10	Shallow to medium deep red clayey soils	Hu, Oa
	11	Structured shallow soils	Sw
	12	Structured medium deep soils	Va
	13	Permanent wetland	

Figure 7. The soil maps for the three focus study areas.

Colour	No	Slope class
	1	< 8%
	2	8% - 12%
	3	12% - 14%
	4	14% - 18%
	5	> 18%

Figure 8. Classified Slope Map and Slope index

The classified slope map above shows that alternative 2 does not have any dolerite dykes which are more prominent within alternative 1 and 3.

Biological Aspects (Fauna & Flora)

- Broad Scale Vegetation Patterns

According to the national vegetation map (Mucina & Rutherford 2006), the entire site falls within a single vegetation type, Northern Upper Karoo. Northern Upper Karoo is one of the most extensive vegetation types in the country and occupies over 40 000km^2 of the interior Karoo. This vegetation type occurs on the Upper Karoo plateau from Prieska, Vosburg and Carnarvon in the west to Phillipstown, Petrusville and Petrusburg in the east. It is bordered by Niekerkshoop, Douglas and Petrusburg in the north and by Carnarvon, Pampoenpoort and De Aar in the south. The vegetation consists of shrubland dominated by dwarf Karoo shrubs, grasses and *Acacia mellifera* subsp. *detinens*, and other low trees particularly on the sandy soils. The vegetation is flat to gently sloping with isolated hills of Upper Karoo Hardeveld in the south and Vaalbos Rocky Shrubland in the northeast and with many interspersed pans (Mucina & Rutherford 2006). Soils and geology are not very specific and consist of shales of the Volksrust formation and the Prince Albert Formation, as well as Dwyka Group diamictites, while there are also dolerite sills and sheets in places. Large areas are also covered by superficial deposits of calcrete from the Kalahari Group. Soils are variable and may be deeper sandy soils or shallow soils of the Glenrosa and Mispah forms. Land types are mainly Ae, Ag and Fc. Four plant species are known to be endemic to the vegetation type, *Lithops hookeriana, Stomatium pluridens*, *Galenia exigua* and *Manulea deserticola*.

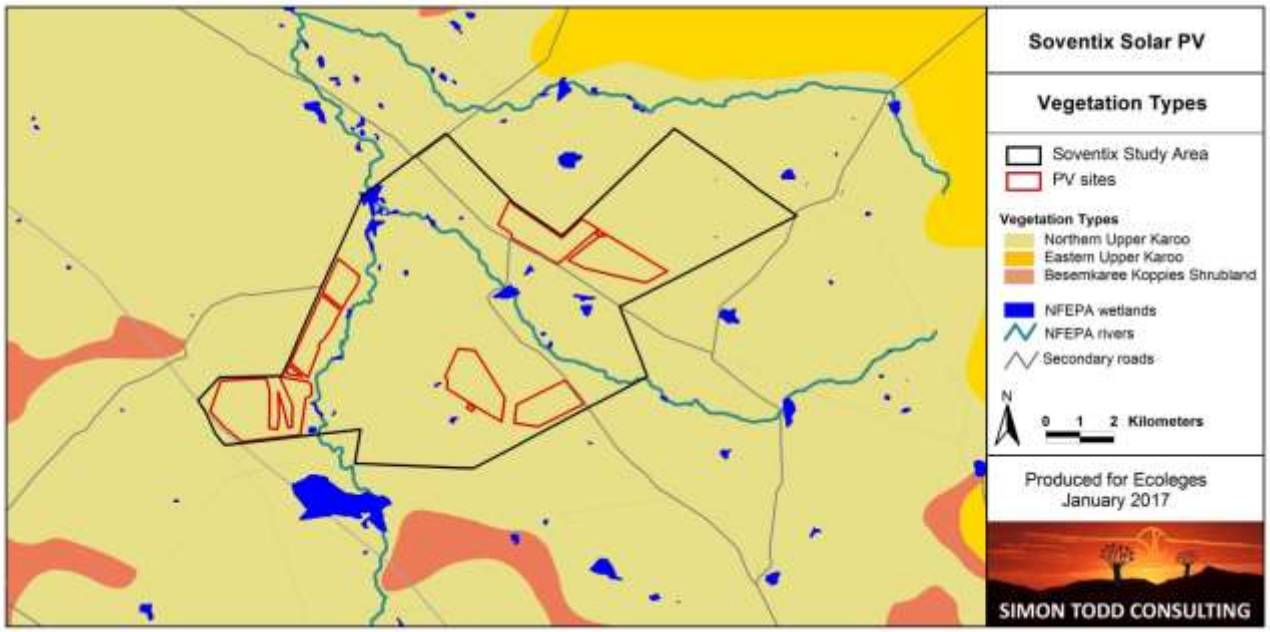

Figure 9. Broad-scale overview of the vegetation in and around the Soventix PV site. The vegetation map is an extract of the national vegetation map as produced by Mucina & Rutherford (2006), and also includes rivers and wetlands delineated by the National Freshwater Ecosystem Priority Areas assessment (Nel et al. 2011).

Northern Upper Karoo has not been significantly affected by transformation and is still approximately 96% intact and is classified as Least Threatened (Mucina & Rutherford 2006). The NFEPA aquatic ecosystems layers show that several highly-ranked priority wetlands occur in the area, many

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supporting cranes, some of which are adjacent to the PV sites. The Brak River is also considered a high priority NFEPA river.

From the results of the site visit and the presence of the Brak River on the site, which clearly has a large floodplain area, it is evident that the Veg Map provides an oversimplification of the vegetation of the site and there are at least three distinct vegetation types present on the site. The open plains of the site correspond with the Northern Upper Karoo vegetation type, but the dolerite hills and koppies present have vegetation more closely allied with Upper Karoo Hardeveld, while the floodplain of the Brak River is clearly characterised by an a zonal vegetation type, allied with Upper Gariep Alluvial Vegetation. The floodplain has however been heavily modified by human activity with a lot of diversion walls and historical disturbance present.

-Site Description

PV1 Site Description

The major feature of the PV1 development area is a series of dolerite ridges and outcrops which characterise the southern part of the proposed development area. Although some of these have been excluded from the footprint, they extend well beyond the excluded areas. As these are physically and ecologically unsuitable for development, they should be excluded from the development footprint. In addition, as there are some areas where the outcrops are scattered across the plains with open areas in between, these areas should be avoided as development of the intervening areas would disrupt the connectivity of the landscape and negatively affect the ecological functioning of this area. The combination of rocky hills and plains creates a diversity of habitats that is important for fauna and the diversity of these areas is higher than areas without open plains. The areas that should not be developed due to the presence of the rocky hills are indicated in Section 3.6.

The site also includes extensive open plains in the north and west that are considered largely suitable for development. The open plains in the north are bounded between the Brak River in the east and the property boundary in the west and have no features of significance. Provided that the Brak River is appropriately buffered from impact, this area is considered highly suitable for development as there are no significant biodiversity present within the development footprint. In the west, the open plains in this area are also considered suitable for development, although there is a low ridge that traverses this area that would also be better avoided.

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Image 1. Looking northwest over the rocky outcrops which characterise the central part of the PV1 area. These are clearly not suitable for development and the intervening areas should also be avoided.

Image 2. Looking south from within the PV1 area, showing open plains between two dolerite ridges. Although the intervening area could accommodate some PV panels, this would disrupt the connectivity and functioning of the landscape and is not recommended.

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Image 3. Looking up the channel of the Brak River which forms the eastern boundary of the northern extent of the PV1 area. Although this area has clearly been degraded through over-utilisation and erosion in the past, it has recovered to a large degree and is important for fauna and ecosystem functioning.

Image 4. Looking north along the northern development area of PV1, showing the homogeneous and open nature of the plains in this area. This is considered a favourable area for development with low impacts on fauna and vegetation.

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Image 5. The northern extent of the PV1 development area, showing the low shrubland which characterises this area. The taller plants visible in the distance are planted prickly pear (*Opuntia*) plants.

Image 6. The western plains of the PV1 development area are also homogenous and considered relatively suitable for development. The rocky ridge visible on the far right of the image is however within the development footprint and would need to be avoided.

PV2 Site Description

The PV2 development area consists of two parts, an eastern and western section, both of which consist largely of extensive open plains. However, the primary difference between the two areas is that large parts of the western section consists of low-lying flats that are seasonally waterlogged. As a

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result of the nature of this area and the potential for ecological impacts due to the disruption of runoff and flow patterns, this area is not considered suitable for development. In addition, as the soils are sometimes waterlogged, significant additional material would need to be brought onto the site to stabilise the soil for construction and operation. There are also some wetlands and pans in this area that are likely to be negatively affected by development of this area.

Image 10. The western part of PV2 consists of flat plains which are important for water movement in the area. The seasonally waterlogged nature of the area is attested by the sedge in the left foreground.

Image 11. Looking out over the western section of the PV2 area, showing the flat nature of this area, with the bright green areas indicating areas where water moves through the plains in broad areas.

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Image 12. A tadpole shrimp *Triops granarius* swims in a ephemeral pool created in a depression within PV2. Other fauna such as clam shrimps Leptestheria spp. were also present.

Image 13. Looking south over PV2, showing the flat nature of the site and the consequent potential for disruption of flow patterns. Standing water associated with a drainage line is also visible in the distance and flooding onto the adjacent plain occurs during large rainfall events.

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Image 14. Looking east over the eastern section of PV2, showing the homogenous plains. This area is considered low sensitivity and suitable for development.

Image 15. The northern section of the eastern section of PV2, showing the homogenous grassy shrub land, which characterises this part of the site. This area is considered low sensitivity and suitable for development.

PV3 Site Description

The majority of PV3 consists of flat open plains with relatively few features or species of conservation concern present. These areas are considered suitable for development and development of these areas would generate relatively low impacts on fauna and flora. There is however a low ridge with runs through the central part of the site and which is not considered suitable for development as the hills are

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significant for biodiversity and ecological functioning. The area which should not be developed is indicated in Section 3.6.

Image 7. Looking west across the eastern half of the PV3 development area from a low rocky ridge, showing the homogenous nature of the plains in this part of the development area. This area is considered low sensitivity and suitable for development from an ecological perspective.

Image 8. The rocky ridge that runs through the central part of the PV3 development is for the most part relatively low, but is ecologically important as it provides habitat for rock-dwelling species as well as larger shrubs and small trees which are not present on the open plains of the area. These areas are not considered suitable for development.

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Image 9. The open plains in the east of the PV3 development area are similar to those in the west and are considered suitable for development. The low ridge which characterises the central part of the PV3 site is visible in the distance.

Listed and Protected Plant Species

According to the SIBIS database, a total of 407 plant species are found in the QDS 3024, of which only four red data-listed plant species are represented, *Chasmatophyllum maninum* and *Chasmatophyllum rouxii* (listed as DDD (data deficient, insufficient information)), *Cynodon polevansii*, which is listed DDT (Data Deficient – Taxonomically Problematic), and *Rapanea melanophloeos*, which is listed as Declining. The *Chasmatophyllum* species are associated with rocky flats and areas of exposed bedrock and *Chasmatophyllum maninum* is confirmed present at the site. *Rapanea* is associated with forest patches that usually occur around the base or in small kloofs of sandstone outcrops in vegetation types such as Besemkaree Koppies Shrubland and as it was not observed at the site and it is highly unlikely to be present. Other species of significance observed at the site include *Stomatium pluridens* and *Euphorbia crassipes*, which are regional endemics and provincially protected, while other protected species include *Aloe broomii* var. *broomii*, *Aloe claviflora*, *Pachypodium succulentum*, *Ammocharis coranica*, and *Boscia albitrunca*.

Critical Biodiversity Areas

The site falls within the planning domain of the Northern Cape Provincial Biodiversity Plan, developed by the Department of Environment and Nature Conservation, Northern Cape (2016). The potential impact of the development on Critical Biodiversity Areas should be considered in detail as these areas have been identified through systematic conservation planning exercises and represent biodiversity priority areas which should be maintained in a natural to near natural state in order to safeguard biodiversity pattern and ecological processes. The CBA maps indicate the most efficient selection and classification of land portions requiring safeguarding in order to meet national biodiversity objectives. Once gazetted, and incorporated into municipal SDFs and bioregional plans, such fine-scale plans are

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recognized under NEMA and the various activities listed under the act come into effect. Figure 4 indicates that the majority of the area under application is ecologically important and consists of Ecological Support Areas, and a few of the sites border Critical Biodiversity Areas, particularly the western sites. In terms of other broad-scale planning studies, the site does not fall within a National Protected Areas Expansion Strategy Focus Area (NPAES), indicating that the area has not been identified as an area of exceptional biodiversity or of significance for the long-term maintenance of broad-scale ecological processes and climate change buffering within the region.

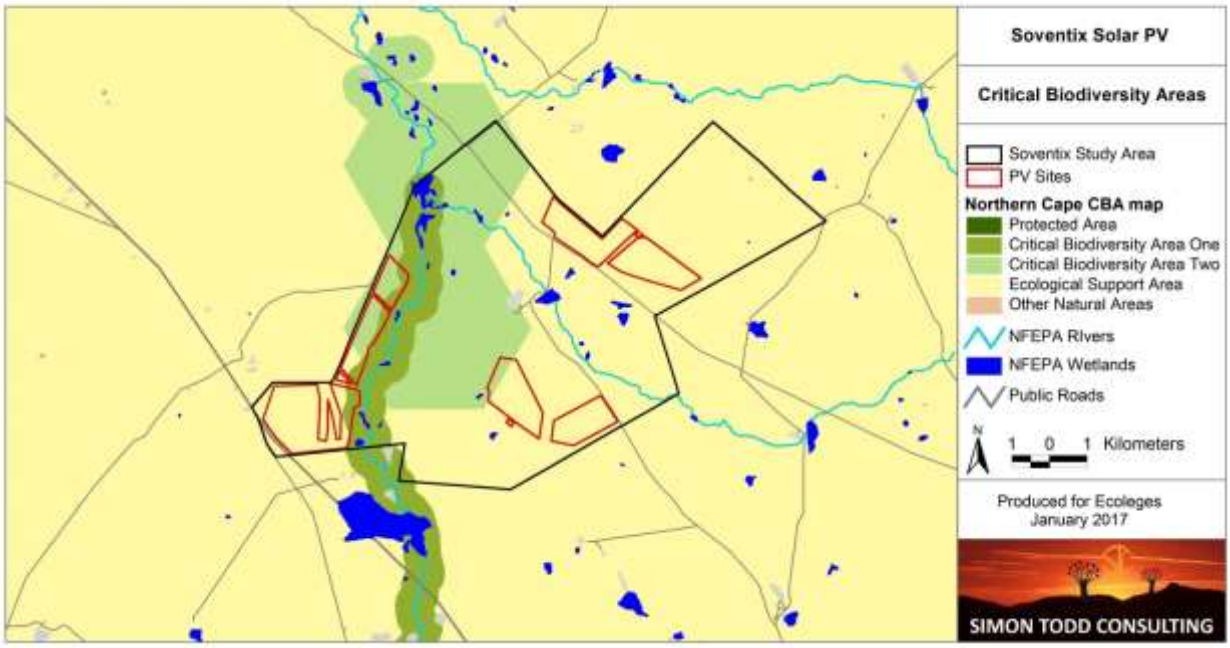

Figure 10. Critical Biodiversity Areas map of the proposed Soventix PV project and the surrounding area.

- Faunal Communities

Mammals

The site lies within the range of 63 terrestrial mammals, including three listed species (EWT & SANBI, Red Data Book of Mammals of South Africa, Lesotho and Swaziland, 2016). The five listed species are the Brown Hyaena *Hyaena brunnea* (NT), South African Hedgehog *Atelerix frontalis* (NT), the African White-tailed Rat *Mystromys albicaudatus* (VU), the Black-footed Cat *Felis nigripes* (VU) and the Serval *Leptailrus serval* (NT). While the Hedgehog and Black-footed Cat are likely to occur in the broad area, the Brown Hyaena is less likely to be present due to naturally low population density as well as persecution from farmers. Adequate cover and water are essential habitat requirements for the Serval and given the sparse cover at the site this species is unlikely to occur here and the area is not viewed as important habitat for this species which favours tall grassland. All of these species have relatively wide ranges across South Africa and the development would not be likely to result in a significant overall decline in the available habitat for these species. At a local level, there is likely to be some impact on listed species if present. However as these are secretive animals which occur at a low density, it is likely that affected individuals would still be able to utilise the majority of the site. In terms of specific habitats and areas at the site which are likely to be of above average significance for mammals, the vicinity of the Brak River is important as habitat as well as for landscape connectivity,

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while the rocky hills are also identified as being important habitat for fauna and have higher species richness than the adjacent plains.

Faunal diversity in the area is quite high and a wide array of species were directly or indirectly observed during the site visit. The majority of species observed are medium sized mammals, typical of the area and no particularly rare or notable species were observed. Species that were observed in the area include Cape Porcupine *Hystrix africaeaustralis*, Steenbok *Raphicerus campestris*, Duiker *Sylvicapra grimmia*, Springbok *Antidorcas marsupialis*, Aardvark *Orycteropus afer*, Rock Hyrax *Procavia capensis*, Cape Hare *Lepus capensis*, Hewitt's Red Rock Rabbit *Pronologus saundersiae*, South African Ground Squirrel *Xerus inauris*, Springhare *Pedetes capensis*, Namaqua Rock Mouse *Aethomys namaquensis*, Black-backed Jackal *Canis mesomelas*, Bat-eared Fox *Otocyon megalotis*, Yellow Mongoose *Cynictis penicillata* and African Wild Cat *Felis silvestris*. Only two species were trapped in the small mammal trapping with the Namaqua Rock Mouse *Aethomys namaquensis* being common in the rocky hills while the Hairy Footed Gerbil *Gerbillurus paeba* was common on the plains. While there are likely other small mammal species present as well, trapping success in arid ecosystems is less than 5% and consequently, less common species are not easily encountered in short-term studies.

Impacts on mammals are likely to be restricted largely to disturbance during the construction phase and habitat loss during the operational phase. Although this is relatively low in the context of the landscape, impacts on habitat fragmentation and landscape connectivity are likely to be increasingly significant as the landscape becomes increasingly transformed as a result of the large number of the developments in the area. The Brak River is likely of significance in terms of landscape connectivity for fauna and it would be important to maintain this clear of development to ensure that it retains this function.

Reptiles

According to the distribution maps available in the literature and the SARCA database, as many as 31 reptiles could occur at the site. Species observed on the site include Bibron's Gecko *Chondrodactylus bibronii*, Southern Rock Agama *Agama atra*, Karoo Girdled Lizard *Karusasaurus polyzonus*, Spotted Sand Lizard *Pedioplanis lineoocellata lineoocellata*, Western Three-striped Skink *Trachylepis occidentalis*, Variegated Skink Trachylepis variegata, Marsh Terrapin *Pelomedusa subrufa*, Verrox's Tent Tortoise *Psammobates tentorius verroxii*, Cape Cobra *Naja nivea* and Leopard Tortoise *Stigmochelys pardalis*. The site represents a relatively rich habitat for reptiles as it contains various types of rocky outcrops as well as densely vegetated riparian areas and flats of varying texture. Despite the likely high reptile richness at the site, no listed species are known from the area.

In terms of the likely impact of the development on reptiles, habitat loss is likely to be of local significance only due to the relatively low footprint of the development and the relatively low reptile diversity of the site. Furthermore, many species would be able to use the vegetation under the panels and some species would take advantage of the buildings and structures present. Some transient disturbance of reptiles during construction is likely due to disturbance and vegetation clearing. Overall, as there are few range-restricted or listed reptile species at the site, impacts on reptiles from the development are likely to be local in nature and not of broader significance.

Amphibians

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Eleven frog species are known from the broad area around the site, including the Giant Bullfrog *Pyxicephalus adpersus* which is listed as Near Threatened. The majority of species known from the area are toads and sand frogs which are relatively independent of water except for breeding purposes, which reflects the aridity of the area. A large proportion of the site contains well developed drainage lines and wetlands, which are likely to be the most important areas for amphibians at the site. Natural pans and man-made shallow water bodies are also present and confirmed as breeding sites for amphibians including the Giant Bullfrog, which can be confirmed present at the site (see image below). These features should be appropriately buffered to limit impact on amphibians at the site.

Habitat loss and erosion would be a primary risk factor for amphibians associated with the development, as this would impact water quality and amphibian habitat. During the construction phase, pollution, particularly from petrochemicals would also be a significant risk factor. With the appropriate mitigation, these risks can however be reduced to an acceptable level.

Avifauna

According to the SABAP 2 database 114 species have been recorded from area (Annex 4), suggesting that it has not been well sampled in the past as the likely total should be closer to 150. This includes eight listed species (Table 1). Some of the listed species are birds which rely on wetlands or rivers which are numerous in the area, suggesting that they may be common visitors or residents. The wetlands in the area are listed as priority NFEPA wetlands due to the presence of Blue Crane *Anthropoides paradiseus* (NT), which often breeds in these areas. Apart from habitat loss within the development footprint, another major potential source of impact of the development on birds would be from any power lines needed for the grid connection which could cause mortalities through electrocution and collisions of susceptible species such as bustards, cranes and flamingos. Given the proximity of the Eskom lines to the site, any required overhead lines would be short, which would be important in mitigating this impact to a low level.

Table 8. Listed bird species known to occur in the vicinity of the proposed site, according to the SABAP 2 databases, and the major potential impact source on these species associated with the development.

Common name	Taxon name	Conservation Status
Bustard, Ludwig's	*Neotis ludwigii*	EN
Crane, Blue	*Anthropoides paradiseus*	NT
Flamingo, Greater	*Phoenicopterus ruber*	NT
Korhaan, Blue	*Eupodotis caerulescens*	Global=NT
Korhaan, Karoo	*Eupodotis vigorsii*	NT
Pipit, African Rock	*Anthus crenatus*	NT
Sandpiper, Curlew	*Calidris ferruginea*	Global=NT
Secretarybird, Secretarybird	*Sagittarius serpentarius*	VU

The following species were identified during the initial site inspection with additional species claimed by the landowner to be resident.

- Blue crane
- Caracal

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- Cape fox
- Bat-eared fox
- Black korhaan
- Steenbok
- Mountain reedbuck
- Pale chanting goshawk
- Black-backed jackal
- Side-striped jackal
- Aardvark
- Porcupine
- Aardwolf
- Springbok
- Riverine rabbit
- Rock rabbits
- Mountain tortoise
- Gemsbok
- Bustard
- Rock hyrax
- Warthog
- Sable

Social Aspect

-Administrative context

The proposed project will be located in Ward 6 of the Emthanjeni Local Municipality that falls under the Pixley Ka Seme District Municipality in the Northern Cape Province. For the baseline description of the area, data from Census 2011, Community Survey 2016, municipal IDP's and websites were used. The Emthanjeni Local Municipality is the seat of the district and is located centrally on the main railway line between Johannesburg, Cape Town, Port Elizabeth and Namibia. It covers an area of 13 472 km^2. The main towns in the area are Britstown, Burgerville, De Aar, Griesenkraal and Hanover.

-Population composition, age, gender and home language

The Pixley ka Seme District Municipality's total population was estimated at 166 849 people, with the ELM accounting for approximately 23% (38 228) (Community Survey, 2007). The average population growth between 2001 and 2010 was estimated at 0.60% (ELM IDP, 2010). Given the size of the Municipality and the relatively small total population size, the population density within the Municipality generally is low at 3.4 people per km2. According to the ELM IDP (2010), the municipal population is largely Coloured (57.5%), followed by Black African (35.3%), White (7.1%) and Asian (<1%). (Emthanjeni Local Municipality, Integrated Development Plan 2011 – 2016).

In Ward 6 almost half of the population belongs to the Coloured population group (Figure 7), with just over two fifths of the population belonging to the Black population group. Ward 6 has a higher proportion of people belonging to the Black population group than on local or district level.

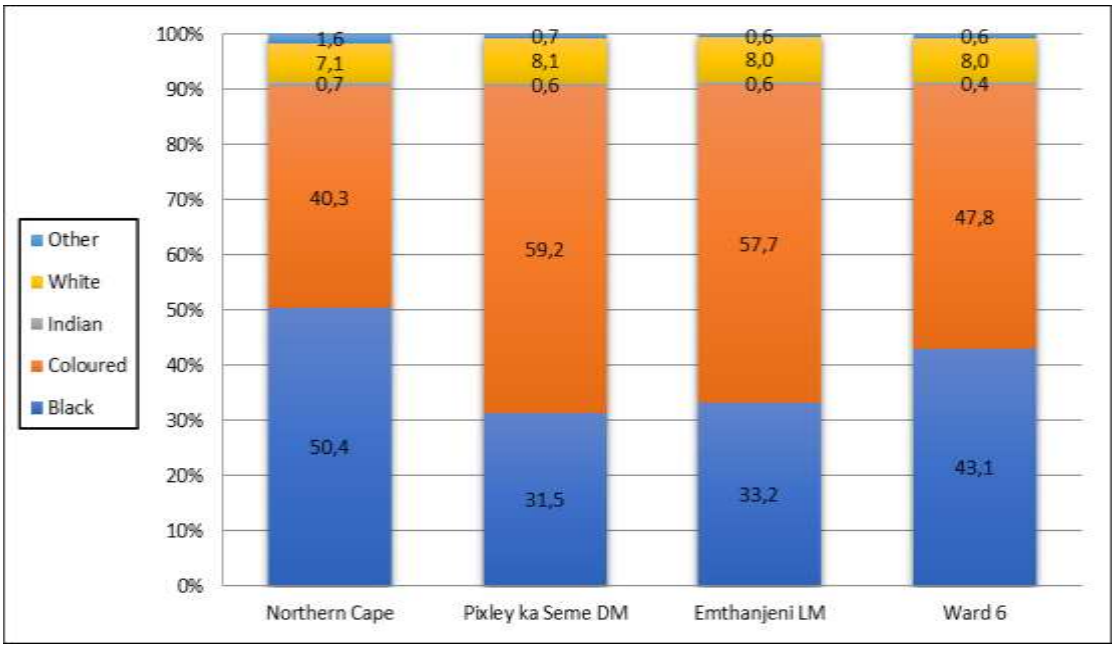


Figure 11: Population distribution (shown in percentage, source: Census 2011)

The average age in all the municipal areas are around 28 years, with the lowest average age (28.24) in Ward 6. Just below a third of the population in Ward 6 is aged 14 years or younger, with almost half aged 24 years or younger. Such a young population place a lot of pressure on resources and infrastructure of the area, and a great demand for future infrastructure and creation of livelihoods can be expected.

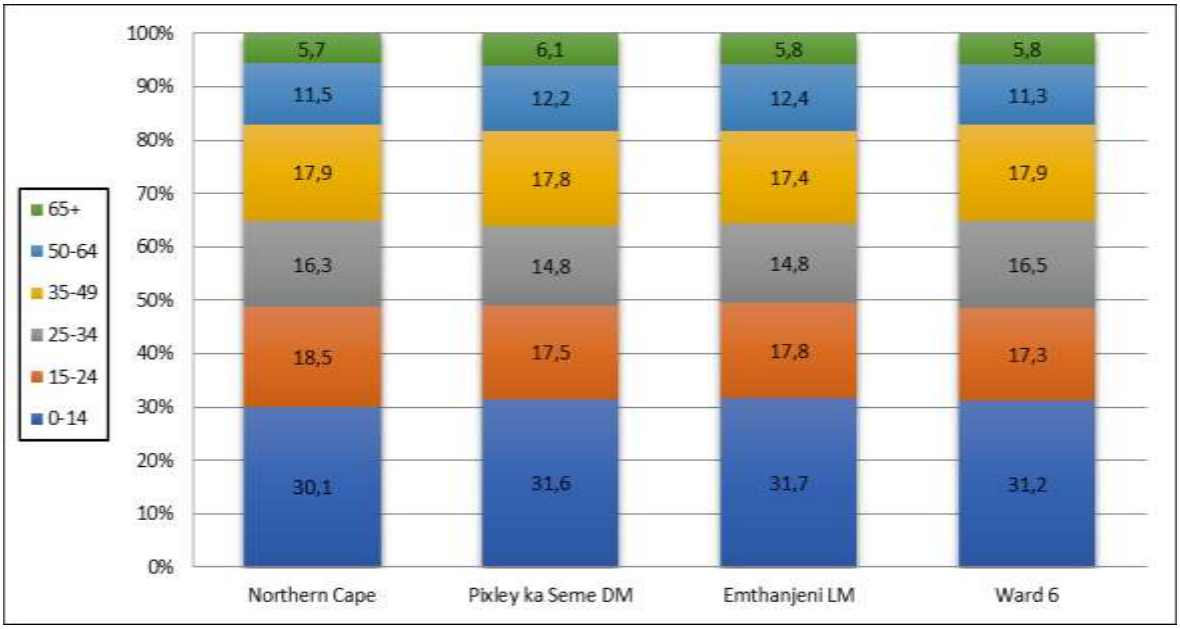


Figure 12: Age distribution (shown in percentage, source: Census 2011)

The gender distribution is more or less equal on all levels (Figure 9).

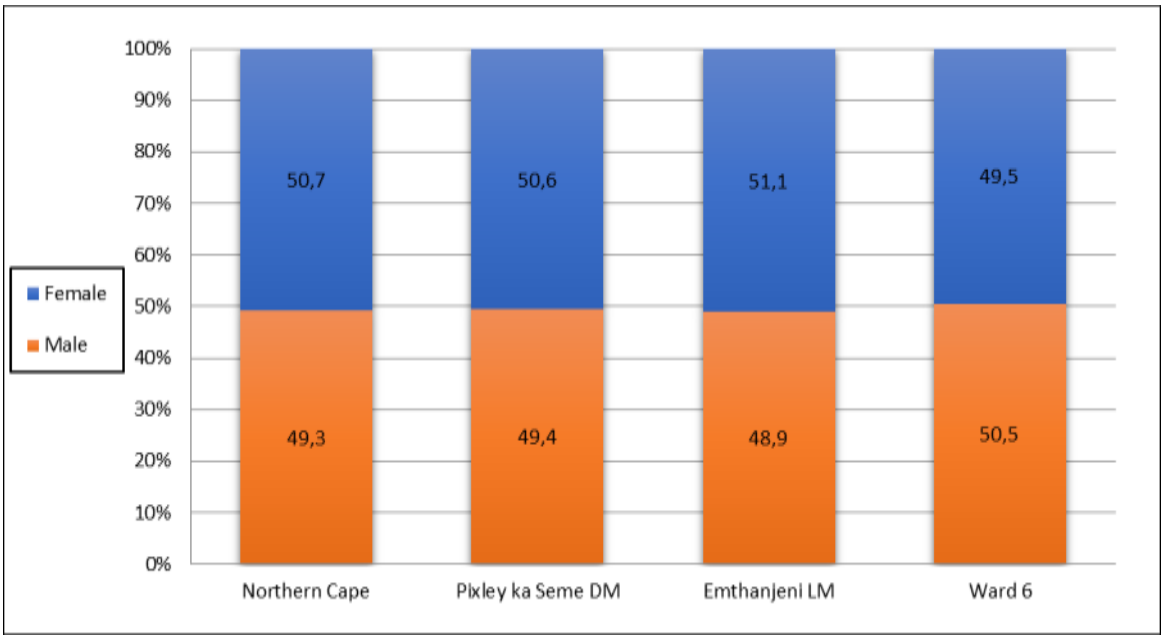


Figure 13: Gender distribution (shown in percentage, source: Census 2011)

Afrikaans is the home language of almost two thirds of the residents in Ward 6 (Figure 10), followed by almost a third with IsiXhosa as home language.

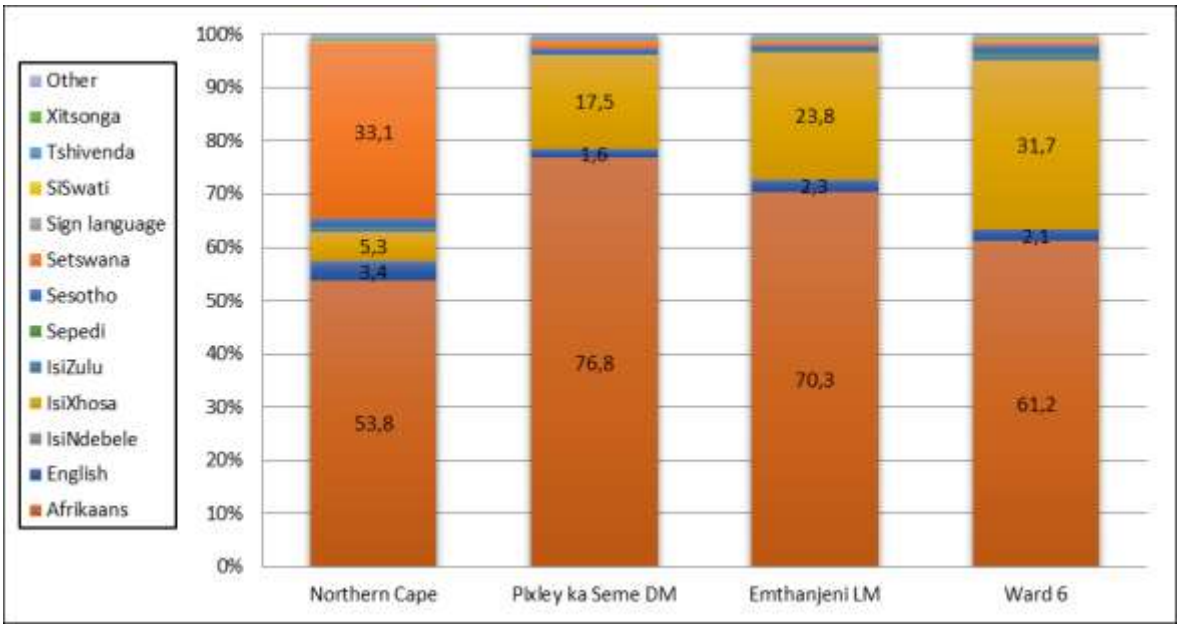


Figure 14: Language distribution (shown in percentage, source: Census 2011)

-Education

About two fifths of the people in Ward 6 aged 20 years or older have no schooling or only some primary education (Figure 11). This is higher than on local, district or provincial level. These high levels of

illiteracy should be taken into consideration when consulting with farmworkers or communities on the project.

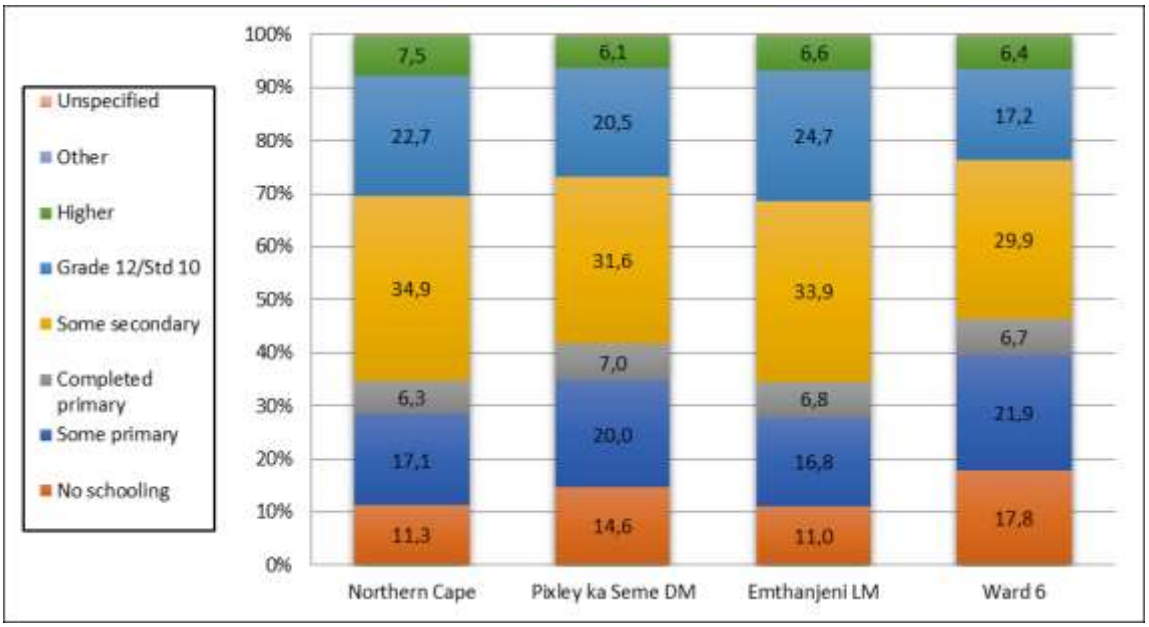


Figure 15: Education profiles (those aged 20 years or older, shown in percentage, source: Census 2011)

-Employment

Ward 6 has the highest proportion of people aged between 15 – 65 years that are employed (Figure 12). Just over half of the people who are employed in Ward 6, are employed in the formal sector (Figure 13). This is much lower than on local or district level. About a quarter of the employed work in the informal sector, which is proportionately higher than on local or district level.

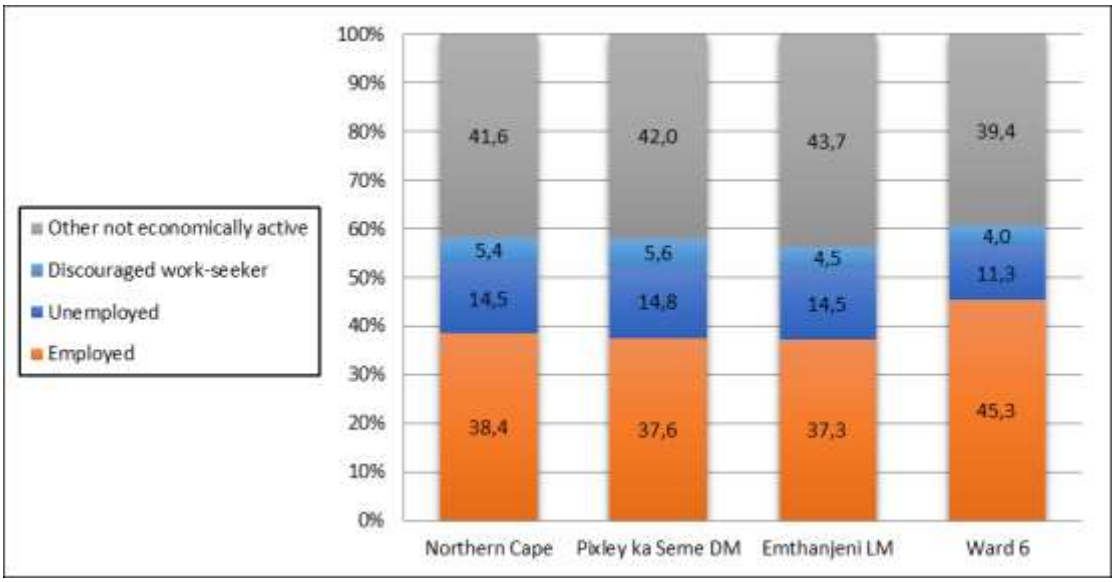


Figure 26: Labour status (those aged between 15 - 65 years, shown in percentage, source: Census 2011)

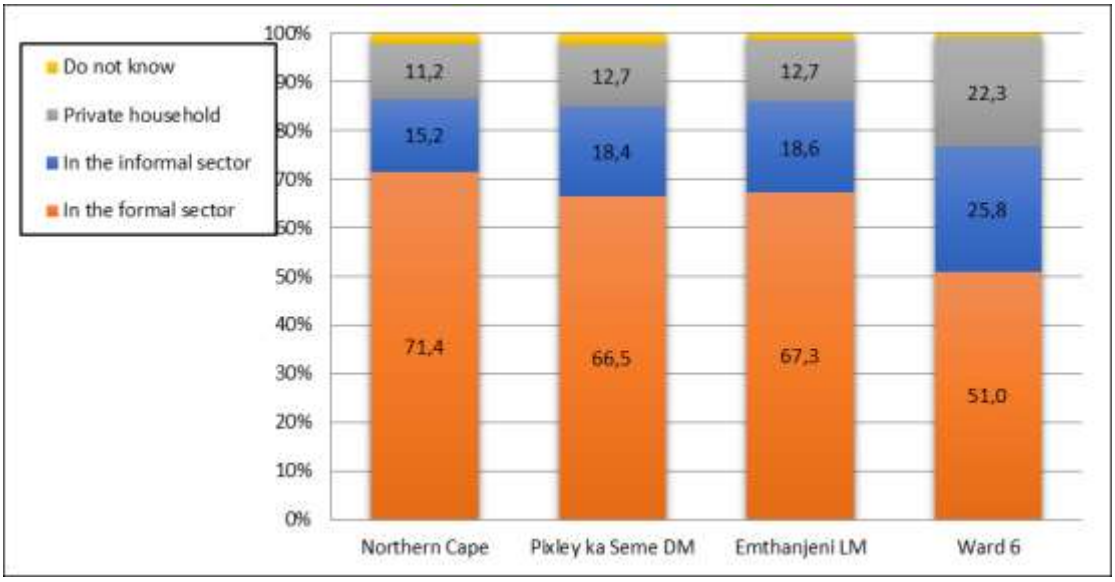
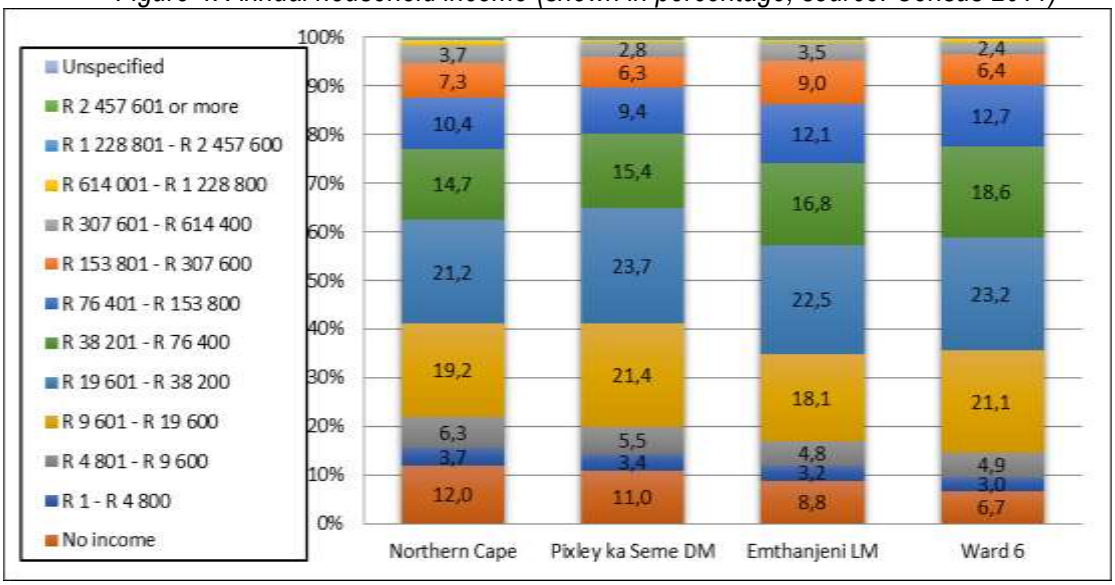


Figure 37: Employment sector (those aged between 15 - 65 years, shown in percentage, source: Census 2011)

The lowest proportion of people with no annual household income is on ward level (Figure 14). Almost 60% of the households in Ward 6 had an annual household income of below R38 201 in 2011.

Figure 4: Annual household income (shown in percentage, source: Census 2011)



-Housing

Almost three quarters of the population of Ward 6 live in areas classified as formal residential, while just over a quarter live in areas classified as farms (Figure 15). More than 90% of households in Ward 6 live in houses or brick structures on separate stands or yards (Figure 16), with caravans or tents the second most used dwelling type. This can most likely be ascribed to construction activities in the area.

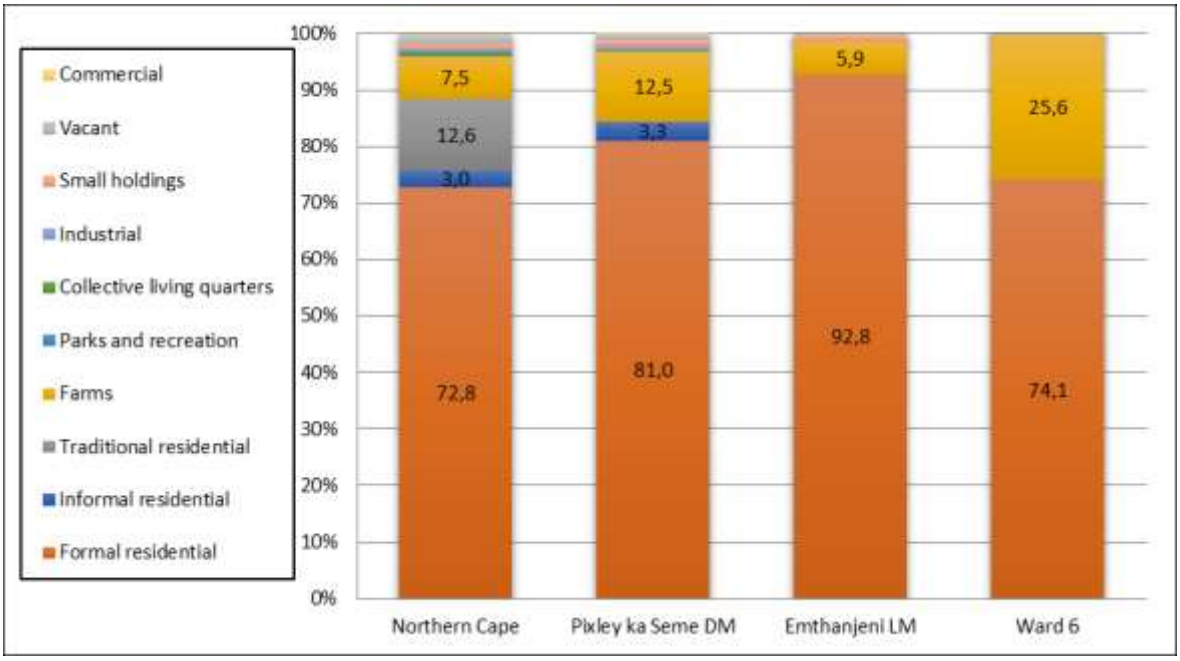


Figure 58: Enumeration area types (shown in percentage, source: Census 2011)

-Access to basic services

Access to basic services such as water, sanitation and electricity relate to standard of living according to SAMPI (Statistics South Africa, 2014). Households that use paraffin, candles or nothing for lighting; or fuels such as paraffin, wood, coal, dung or nothing for cooking or heating; have no piped water in the dwelling or on the stand and do not have flush toilets can be described as deprived in terms of these basic services.

Almost a third of the households in Ward 6 get their water from a borehole (Figure 19), a much higher proportion than on local, district or provincial level, while just over 60% get their water from a regional or local water scheme, much lower than on local, district or provincial level.

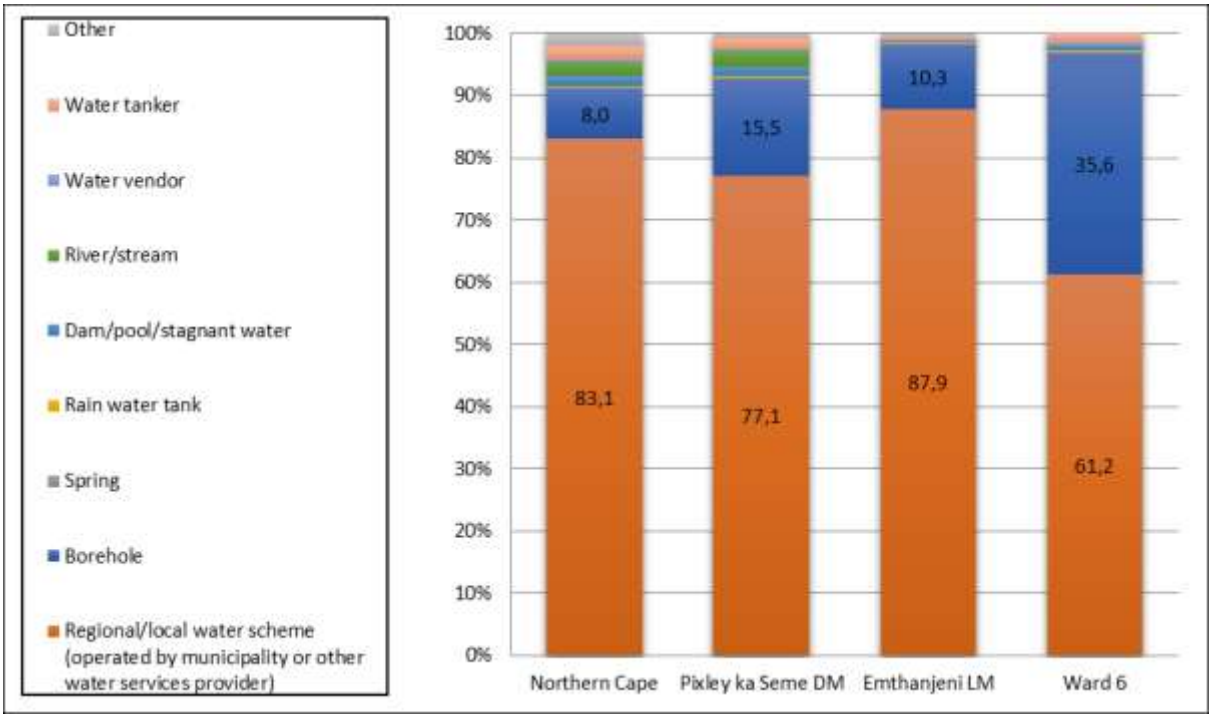


Figure 6: Water source (shown in percentage, source: Census 2011)

Just over a third of households in Ward 6 have access to piped water inside their dwellings (Figure 20), a lower proportion than on local, district or provincial level, while just over half of the households have access to piped water inside their yards.

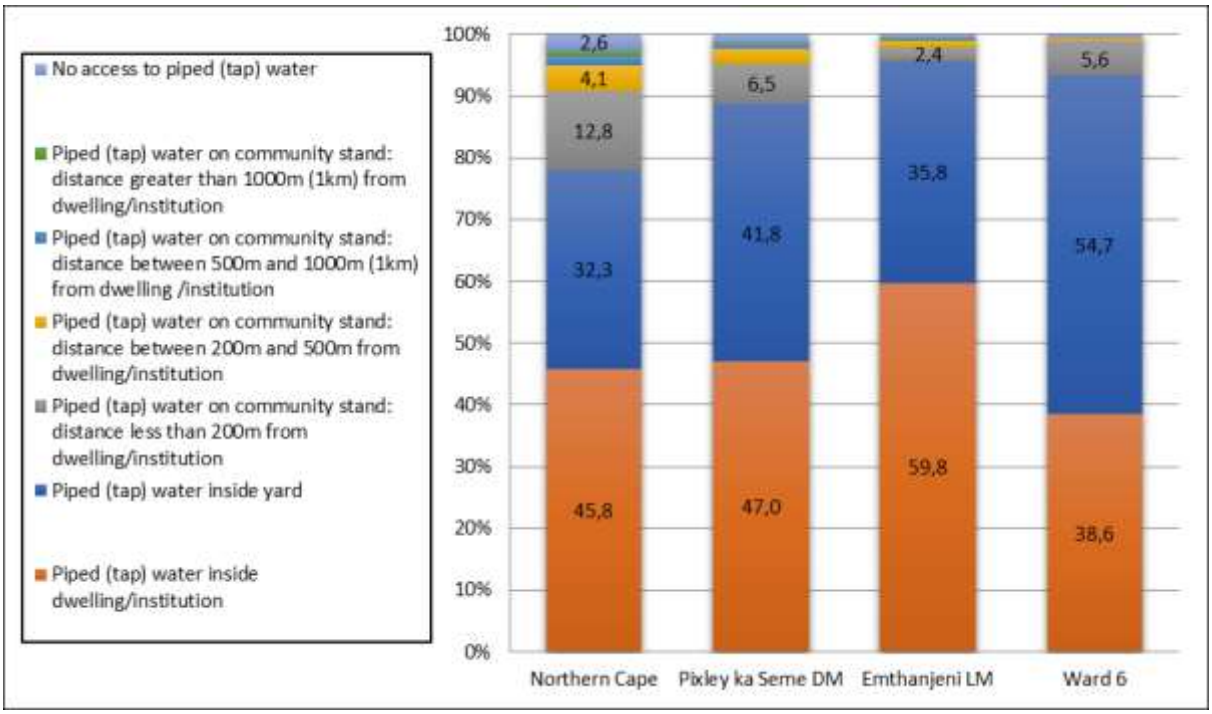


Figure 7: Piped water (shown in percentage, source: Census 2011)

Access to electricity for lighting purposes give an indication of whether a household has access to electricity, as poor households sometimes only use electricity for lighting, but use other sources of energy for heat and cooking. The incidence of households with access to electricity on ward level is

higher than on district or provincial level (Figure 21), with more than 90% of households having access to electricity for lighting purposes.

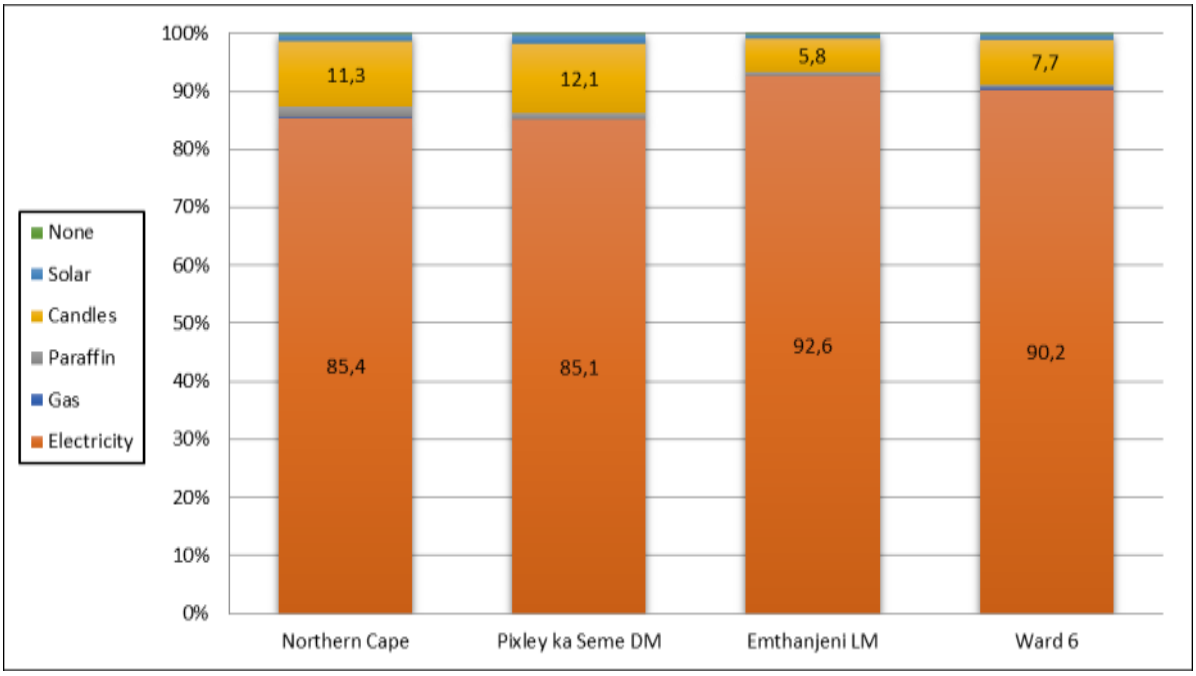


Figure 8: Energy source for lighting (shown in percentage, source: Census 2011)

More than 70% of households on ward level have access to flush toilets that is either connected to a sewerage system or with a septic tank (Figure 22). The highest proportion of flush toilets with a septic tank is found on ward level, as can be expected in an area with a high incidence of farms. The highest proportion of pit toilets with ventilation is also found on ward level.

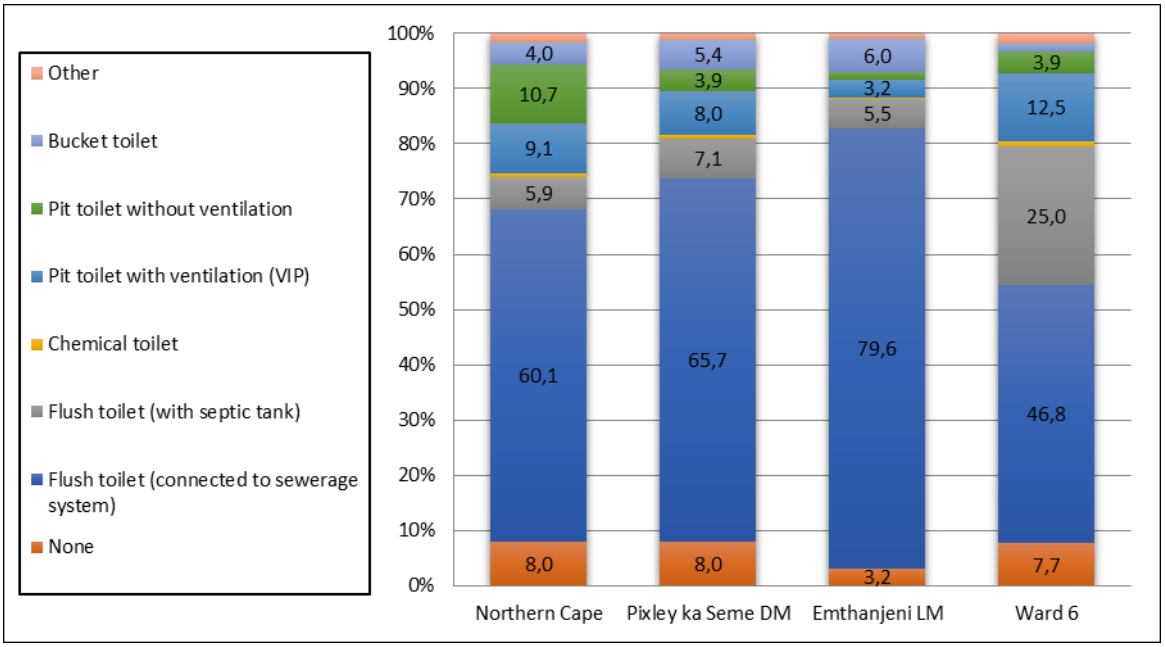


Figure 9: Sanitation (shown in percentage, source: Census 2011)

Almost a third of households on a ward level have their own refuse dumps (Figure 23) with just over half of the households having their refuse removed by a local authority at least once a week. This is due to the high incidence of farms in the ward.

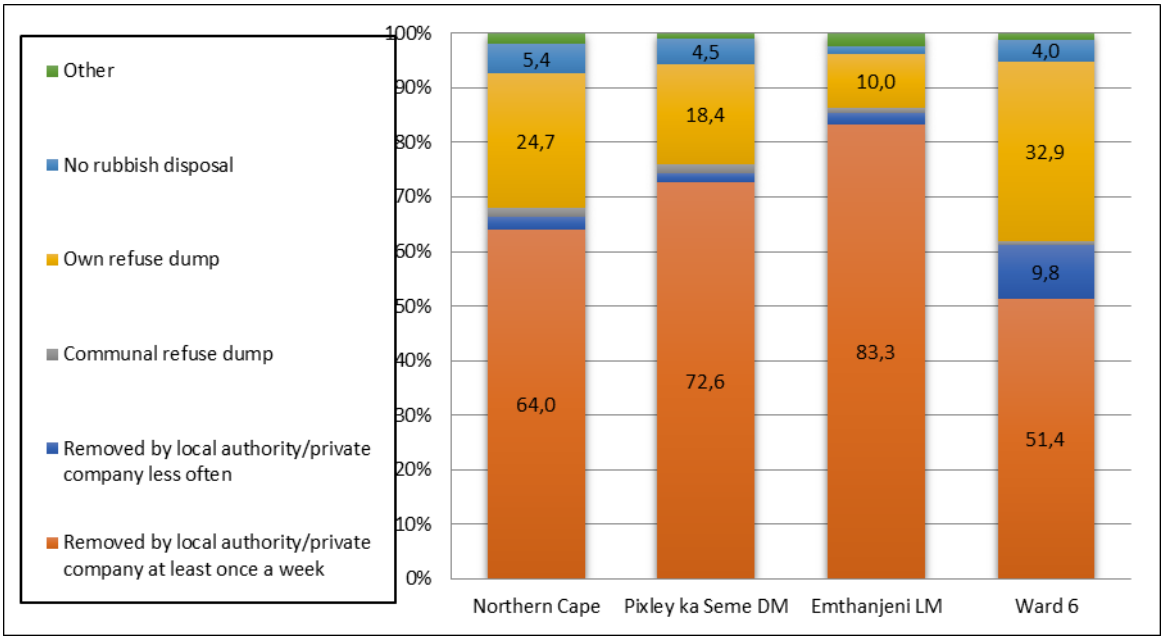


Figure 10: Refuse removal (shown in percentage, source: Census 2011)

Economic Aspects

Agriculture forms the backbone of the economy of the Emthanjeni LM (Emthanjeni LM IDP, 2016/2021) with mutton and wool being the main produce. Besides sheep farming, cattle, goat, pig and game are also being farmed. The manufacturing sector shows potential for growth through the introduction of renewable energy projects in De Aar and the surrounding areas. There are also stone crushers in the area that specialise in the manufacturing of sand, bricks cement and rocks. Other economic activities include services, retail, transport and tourism.

De Aar is the main town of Pixley ka Seme and is a potential industrial growth point with ample industrial sites, reasonable prices and tariffs, affordable labour and the necessary infrastructure. De Aar is therefore the ideal place to establish industries, a fact which can be borne out by various major industries which have already established themselves here. The central location and excellent rail and road links have resulted in several chain stores opening branches.

Hanover is also well endowed with qualified construction industry artisans. Like the other towns in this region, wool is exported to Port Elizabeth without being processed. We note with great concern the opportunities for local people in relation to the second economy but we also further identified the need for the municipality to become involved with the empowerment of SMME's and the roll out of cooperatives. This should enable the second economy initiatives to become active contributors to the economy of Emthanjeni as well as the entire district.

Heritage Aspects

-Palaeontological Resources

The possible impact of the proposed development on palaeontological resources is gauged by using the fossil sensitivity maps available on the SAHRIS and the nature of the proposed development.

Karoo Sedimentary Rocks

The Beaufort Group contains fossils of diverse terrestrial and freshwater tetrapods of Tapinocephalus and Lystrosaurus genere (amphibians, true reptiles, synapsids – especially therapsids), palaeoniscoid fish, freshwater bivalves, trace fossils (including tetrapod trackways) and sparse vascular plants (Glossopteris Flora, including petrified wood) that dates to the Late Permian – Early Triassic Periods (c. 266 – 250 Ma).

The area of the proposed development where this geological signature is regarded as highly sensitive with regards to palaeontological heritage.

Karoo Dolorites

No fossil heritage has been recorded in these intrusive dolerites (dykes, sills) and associated diatremes. The dolorite dykes and sills within the area of the proposed development are not palaeontologically significant. Notice must however be taken of the presence of these features as Stone Age quarry sites are usually found at the foot of dolerite hills hornfel outcrops occur. Dolerite is also associated with engraving sites. One such site has been recorded at the Commonage in Hanover Town.

Archaeological Resources

Archaeological heritage resources and cultural landscapes are linked to specific time periods. In summary, the various eras are as follows:

The Stone Age time period is divided between three different time periods, namely:

Early: c. 2 500 000 to 150 000 Before Common Era

Middle: c. 150 000 to 30 000 Before Common Era

Late: c. 30 000 Before Common Era until the historical time periods commenced

The Stone Age is well represented in the area by the archaeological remains associated with Stone Age hunter gatherers and herders and includes cave shelters and surface sites (Goodwin & van Riet Lowe 1929, Sampson 1985 and Bousman 1991). These occurrences cover represent the Early, Middle and Later Stone Ages. Erosion gullies and river/streambeds and dolerite outcrops are usually associated with stone tool assemblages.

Sampson (1972 & 1974) surveyed the Seaco Drainage near Hanover and recorded numerous Stone Age sites ranging from the Early, Middle and Later Stone Ages. Proto-historic sites associated with pastoralist was also recorded. His research established a model for identifying stone tool industries and occupations in the entire district (Huffman 2013).

Surface scatters of stone tools (mostly Early and Middle Stone Age) were recorded during various Heritage Impact Assessments:

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The farm Plooysfontein 93 (Palaeo Field Services) in the Hanover District Erf 3094 on the old De Aar 180 farm (Huffman, 2013)
Low to medium density stone tools have been identified within 46 metres of the borrow pit and these are the type of stone tools that are known to occur in the De Aar and Burgerville areas. S 30 50 1.95 E 24 18 10.3. A variable density of stone artefacts, mostly of Pleistocene age, was noted over most of the area examined during the Archaeological Specialist Input on the site of the proposed Taaibosch Photovoltic between De Aar and Hanover (David Morris, 2011)

Rock art sites have also been recorded (Morris 1988, Rudner & Rudner 1968). Included is the engraving sites at the Hanover Town Commonage and at the farm Groenfontein, Hanover District. (Palaeo Field Services)
The Iron Age and farmer period occurred in southern Africa from Common Era (2000 years ago to 1950) to historical periods. The definition is divided between Early Iron Age (c. 200 CE to c. 1400 CE) and Late Iron Age (c. 1400 CE to 1800's (Archaic, 2008)). The historical period indicates dates from 1500s to present (Natalie Swanepoel, Amanda Esterhuysen and Phillip Bonner, 2007). The Iron Age is defined as a time period that occurred during c. 200 to c. 1000 Common Era, named as the early period, and c. 1000 to 1800's Common Era (Archaic, 2008). The Iron Age is not represented in the general area of the development. No Iron Age sites should be present.

More Recent Events/Historical Period
Usually refers to white or literate history, but more recently also refers to the last five hundred years of South African history. Dates from 1500s to present. Farms and other historical settlements in the area dates back to the 1840's, whilst the area also have evidence associated with the South African (Anglo Boer War). Signs of historical occupation is common in the general area and includes abandoned sheep kraals and homestead ruins. Old railway infrastructure (housing, old railway lines and foundations) was also recorded (S30°49'26.29" E24°17'31.31") at nearby Burgervilleweg (Becker). The proximity of the railway means that material traces may exist alongside that relate to its construction, maintenance and use, and its protection by way of blockhouses, as a major transport route for British forces further inland during the Anglo-Boer War. The Google Earth image of the area clearly shows different generations of railway alignment within the study area. Jean Beater's heritage report describes Anglo-Boer War redoubts (components of a blockhouse line) on the north side of the older railway.

Where dolerite koppies occur, there is a possibility that rock engravings might be found, while rock paintings might be found in shelters formed either in certain dolerite topographic formations or in shelters where sandstone scarps provide for their formation. More or less rich spreads of Stone Age artefacts may occur across this Karoo landscape with localised 'sites' having higher densities. More recent heritage features of note may exist in the vicinity of railway and farm infrastructure.

<u>Cultural Aspects</u>

<u>De Aar</u>
It is the second-most important railway junction in the country[1], situated on the line between Cape Town and Kimberley. The junction was of particular strategic importance to the British during the

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Second Boer War. De Aar is also a primary commercial distribution centre for a large area of the central Great Karoo. Major production activities of the area include wool production and livestock farming. The area is also popular for hunting, although the region is rather arid. De Aar is also affectionately known as " Die SES " deriving its nickname from the six farms that has surrounded De Aar since the 1900. (Website: www.wikipedia.org)

Hanover

Hanover claims to be the country's most central place. It is equidistant from Cape Town and Johannesburg, centrally positioned between Cape Town and Durban as well as Port Elizabeth and Upington and it is the hub of an arc formed by Richmond, Middelburg and Colesberg.
Historic figures were at the centre of life here, people like Olive Schreiner, author and women's rights champion, and the tempestuous Rev. Thomas Francois Burgers. Among its residents were the wealthy and eccentric. The town's chief constable was the grandson of Lord Charles Somerset, the magistrate's clerk a son of Charles John Vaughan, Dean of Llandaff, well-known churchman and devotional writer of his day, and the local doctor was the son of a former Solicitor-General of Jamaica. Well-known people of today hailing from Hanover includes Zwelinzima Vavi, the General Secretary of the Congress of South African Trade Unions.

Today the busy Karoo N 1 route cuts through the veld between the town and its cemetery. But during the last century all roads converged in Hanover and all travellers passed through the town. It was on an important stop for stage coaches carrying passengers to the Diamond Fields, and the Free State mail was carried through by post cart. Daily life bubbled with people ever on the move. But then in 1884, the advent of the railway deprived the town of much of its through traffic and its character slowly changed. (Website: www.wikipedia.org)

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The Impacts and Risks Identified for each Alternative.

(v) The impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts-

(aa) can be reversed;
(bb) may cause irreplaceable loss of resources; and
(cc) can be avoided, managed or mitigated;

Please refer to the Impact Assessment in **Appendix E.**

The Methodology used in Determining and Ranking the Impacts and Risks associated with the Development Footprint.

(vi) The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;

Please refer to the Impact Assessment in **Appendix E.**

The Positive and Negative Impacts that the Proposed Activity and Alternatives on the Environment and Community.

(vii) Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community, that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.

Please refer to the Impact Assessment in **Appendix E.**

The Possible Mitigation Measures application and level of Residual Risk.

(viii) The possible mitigation measures that could be applied and the level of residual risk;

Please refer to the Impact Assessment in **Appendix E.**

No Alternatives:

(ix) If no alternative development **[locations]** footprints for the activity were investigated, the motivation for not considering such: and

Not applicable.

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The Concluding Statement.

(x) A concluding statement indicating the location of the preferred alternative development [location] footprint within the approved site as contemplated in the accepted scoping report;

The preferred technology alternative is a Solar PV plant which is the most feasible option for the northern Cape, which is experiencing increasing interest in this development sector. The Solar PV technology is the most reliable of the renewable energy technologies considered for electricity generation. As a solid-state technology, it has the advantage of being able to directly convert sunlight into electricity. Whereas other renewable energy technology including wind, biomass and other solar options must indirectly convert the received energy to thermal or mechanical energy prior to producing electricity.

The core business of the project proponent is PV panel development and installation for the use in the generation of electricity. As such, the fundamental alternative of a development other than to conduct and operate a solar energy facility is therefore not viable in this case and will not be considered further in the EIA.

The preferred site was considered to successfully meet the required criteria to operate an efficient Solar PV plant. The farm portions selected in the Hanover District of the Northern Cape have the benefits of high quality solar irradiation, excellent sun orientation and abundant flat topography. In addition, the vital and necessary Eskom infrastructure including sub stations and powerlines to tie in the Solar PV plant are available.

The Scoping process identified the potential positive and negative environmental (biophysical and social) impacts associated with the proposed establishment of a Solar PV Plant at three (3) alternative locations within the preferred site. Several issues for consideration were identified by the EAP and appointed Specialists during the scoping process.

These environmental aspects have been evaluated further within the EIA phase for the development footprint alternatives and selection of the preferred footprint for the proposed Solar PV Plant. The findings and recommendations of the appointed specialists, IAP's and EAP provided the information to complete the development footprint selection matrix and impact assessment to determine the preferred footprint alternative. This identified the cumulative impacts of the footprint alternatives and using GIS mapping produced a no-go area for development based on the sensitivity. This meant that the original footprints had to be altered because of environmental sensitivity and no-go areas. This narrowed down the options of certain alternatives and identified that only PV02 and PV03 could accommodate the 225MWac plant. The PV01 footprint alternative had been reduced and couldn't be expanded due to the sensitivity of the area. The motivation for PV02 as the preferred alternative compared to PV03 was based on its least negative weighting score established with the impact assessment and footprint selection matrix.

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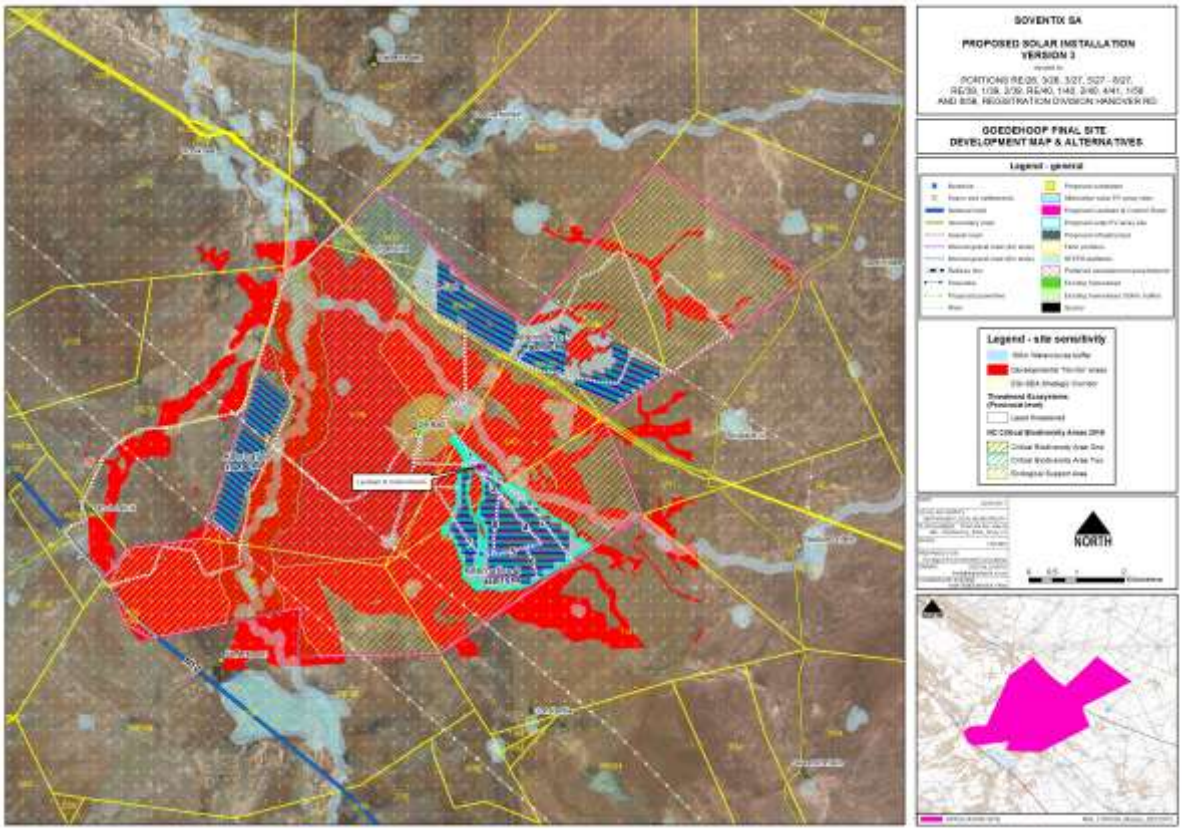

Figure 24. The preferred alternative development footprint and alternatives.

In summary, following the combination of the development footprint selection matrix exercise, impact assessment and cumulative impact assessment using the specialist findings, Interested and affected parties' comments and the EAP judgement, provided the motivation for PV02. As this preferred alternative had the least negative weighting score when compared to the two other alternatives for geographical, physical, biological, social, economic, heritage and cultural aspects.

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SECTION I: DESCRIPTION OF PROCESS TO IDENTIFY, ASSESS AND RANK IMPACTS DEVELOPMENT FOOTPRINT ON THE APPROVED SITE AS CONTEMPLATED IN THE ACCEPTED SCOPING REPORT THROUGH THE LIFE OF THE ACTIVITY.

(i) a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including-

Description of Environmental risks and mitigation measures.

(i) a description of all environmental issues and risks that were identified during the environmental impact assessment: and

(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures:

Please refer to the Impact Assessment in **Appendix E.**

SECTION J: ASSESSMENT OF IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK.

(j) an assessment of each identified potentially significant impact and risk; including-

(i)	***cumulative impacts**;*
(ii)	*the nature, significance and consequence of the impact and risk;*
(iii)	*the extent and duration of the impact and risk;*
(iv)	*the probability of the impact and risk occurring;*
(v)	*the degree to which the impact and risk may cause irreplaceable loss of resources*
(vi)	*the degree to which the impact and risk can be mitigated;*

Please refer to the Impact Assessment in **Appendix E.**

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Cumulative Effects

A guide prepared for the Canadian Environmental Assessment Agency (CEAA) (Hegmann et al. 1999) defined cumulative effects as: *"…changes to the environment that are caused by an action in combination with other past, present and future human actions."*

Cumulative effects are commonly understood as the impacts which combine from different projects and which result in significant change, which is larger than the sum of all the impacts. (DEAT (2004) Cumulative Effects Assessment, Integrated Environmental Management, Information Series 7, Department of Environmental Affairs and Tourism (DEAT), Pretoria)

Cumulative effects can then occur when impacts are:
(1) additive (incremental);
(2) interactive;
(3) sequential; or
(4) synergistic.

Eccles et al. (1994) summarises the essence of cumulative environmental change as follows:

"Where the intensity of development remains low, the impacts can be assimilated by the environment over time, and cumulative effects do not become a significant issue. However, when development reaches a high level of intensity, impacts cannot be assimilated rapidly enough by the environment to prevent an incremental build-up of these impacts over time. Changes over time and space accumulate and compound so that in aggregate the effect exceeds the simple sum of previous changes. This temporal and spatial accumulation gradually alters the structure and functioning of environmental systems, and subsequently affects human activities."

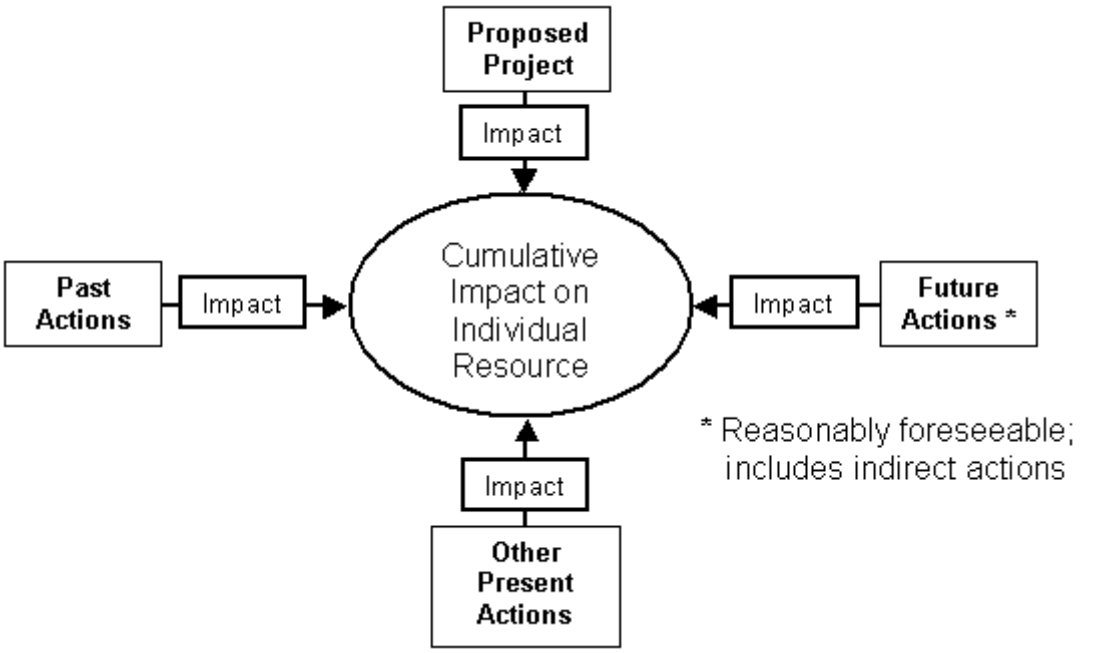

Figure 25. A flow diagram showing the compounding effects of cumulative impacts on a resource.

The EIA would need to identify and investigate the potential cumulative effects of the proposed development taking into consideration the types and characteristics of aggregate effects. These can be fragmentation, compounding effects, indirect effects, triggers and thresholds.

Planning to address cumulative effects involves delineating spatial and temporal boundaries, determining future development and determining the significance of cumulative impacts. The selected method to identify and assess cumulative effects for this EIA was primarily based on Geographic Information Systems (GIS). This computer tool uses powerful mapping and spatial information for capturing, displaying and analysing digital data. Map overlays have been used to identify areas where effects are likely to be greatest.

The following cumulative impact maps below have been produced by overlying all specialists GIS shapefiles or Google Earth. kml files using the sensitive receptor information to form a consolidated "no-go" area map from a geographical, physical, biological, social, economic, heritage and cultural aspects;

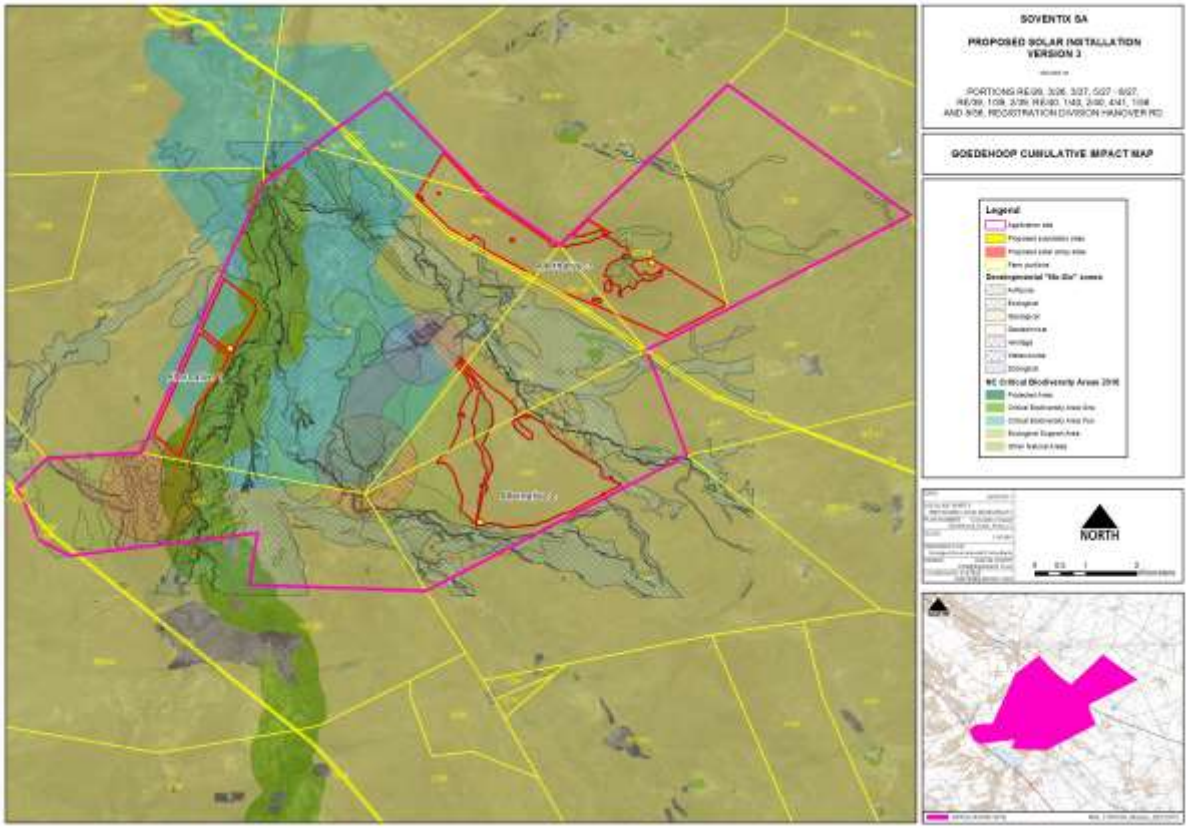

Figure 26. The Goedehoop Cumulative Impact Map

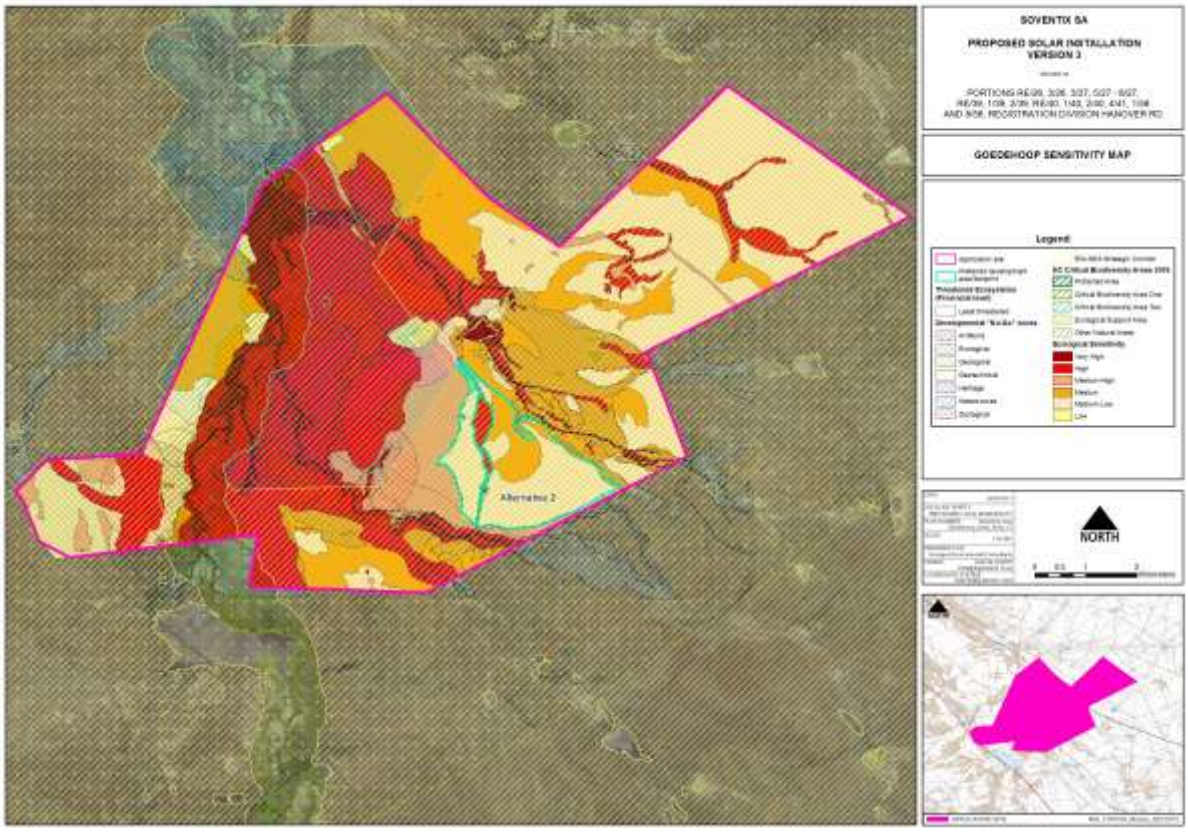

Figure 27. The Goedehoop sensitivity map.

This exercise used the method of bio-geographical analysis, including landscape analysis looking at patterns, structure and ecological process within a spatial unit (i.e. the project development footprint alternatives within the approved site). The PV01 footprint has been altered to remove the critical biodiversity area that was identified in the ecological impact assessment and PV02 footprint changed to remove the area of floodplain in the south which could be problematic in the wet season. Due to two significant heritage sites at PV03 it has required an alteration to the footprint boundary. There was also the carrying capacity analysis which identifies thresholds as constraints to development, in the ecological context, carrying capacity is defined as the threshold below which ecosystem functions can be sustained.

The additional method to identify the potential cumulative impacts included the checklist technique in which potential cumulative impacts can be identified by using a list of common or likely effects. This was undertaken within the development footprint selection matrix and the completion of the impact assessment within Appendix E.

The consideration of different spatial configurations of the proposed development footprint alternatives were directed by the GIS cumulative impact maps (**Figure 26 & 27)** and the findings of the impact assessment process and development footprint selection matrix. These guided the EAP to establish the preferred development footprint that that would avoid areas that have a higher cumulative impact if they were to be developed. Alternative 2 had the least negative weighting score compared to the other two alternatives 1 and 3.

The other pathway within cumulative impacts of a proposed development could be the compounding effect from one or more processes. The method of interactive matrices involves analysis of the additive and interactive effects of various configurations of multiple similar projects in the same geographic area. This has been identified within **Figure 27** below, which highlights other renewable energy projects within the De Aar area.

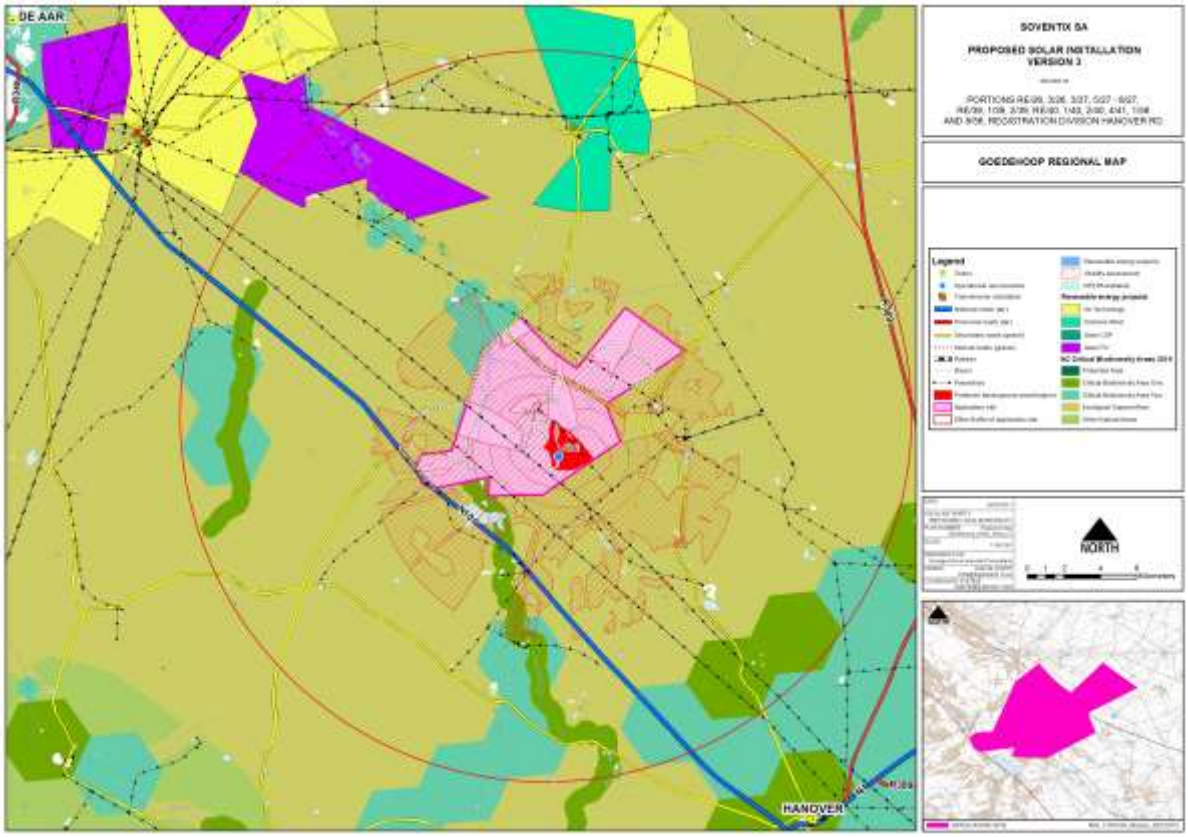

Figure 27. The Goedehoop regional cumulative map

Due to the large number of developments in the broader area, there is potential for cumulative impact to generate additional impacts on broad-scale ecological processes and the countries' ability to meet conservation targets. A map of all the DEA-registered renewable energy developments in the area is depicted in **Figure 28** below and illustrates that the current development site is surrounded by a number other renewable energy development. Several of these are already constructed or currently under construction. However, the DEA map does not indicate the actual footprint of the facilities which are, in most cases, much smaller than the cadastral units indicated. Consequently, cumulative impacts are a concern in the area and their impact on fauna is highlighted as a greater concern than that on flora. The vegetation in the area, especially on the plains, is Northern Upper Karoo which is one of the most extensive vegetation types in the country and has a low overall abundance of species of conservation concern. In terms of fauna, smaller fauna such as rodents will experience some habitat loss due to transformation within the footprint of the current and other PV facilities. Medium and larger fauna are however likely to be more vulnerable to the cumulative impacts of development as they would be affected by habitat loss, difficulty in passing security fencing as well as noise and disturbance. In context of the current project, the plains around the site are still largely undeveloped and the three

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proposed development areas are separated by some distance, which would facilitate movement of fauna across the site as there will still be large intact corridors present. In addition, the Brak River is likely to be an important movement corridor in the region and, as this will not be directly affected by the development, the overall impact on landscape connectivity is likely to be low, especially given the largely intact nature of the surrounding landscape.

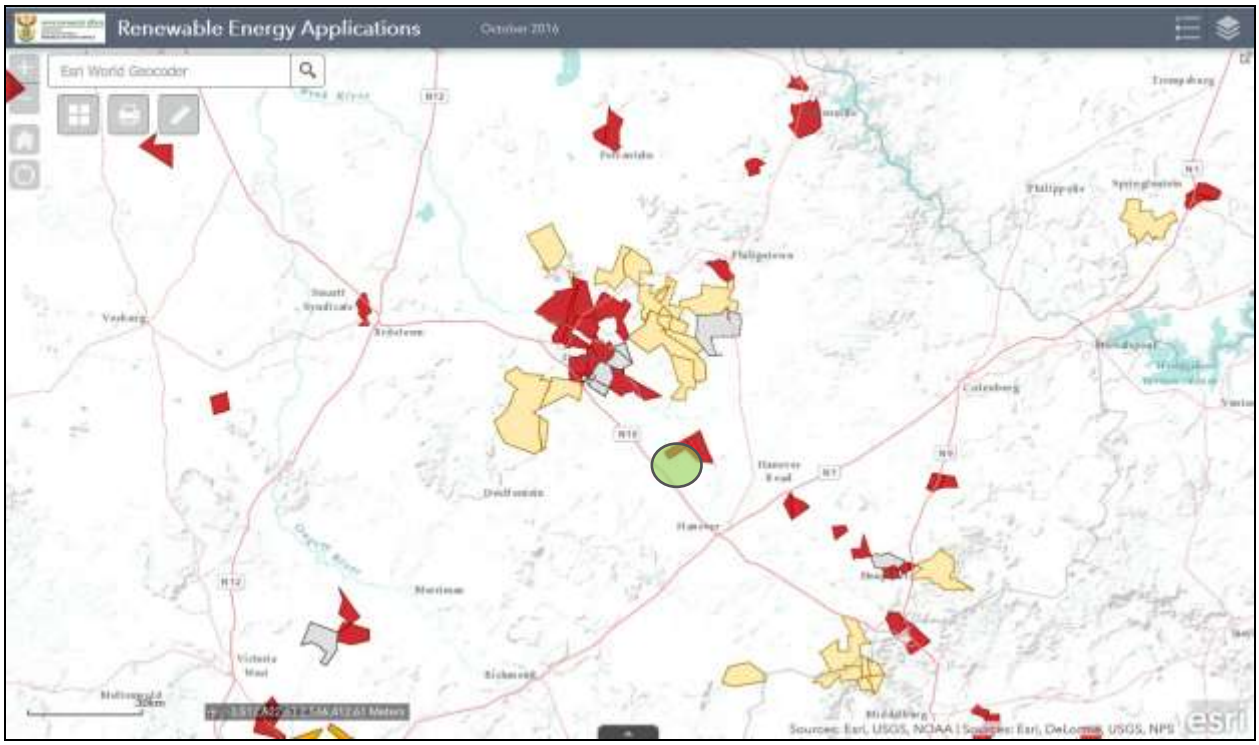

Figure 28. The Soventix PV site, represented by the green oval, lies within a broader matrix of other proposed and built renewable energy facilities (red indicates PV and the pale-yellow wind energy developments) in the landscape. It is however important to note that the actual facilities are considerably smaller than the cadastral units depicted above.

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SECTION K: SUMMARY OF SPECIALIST REPORT FINDINGS AND RECOMMENDATIONS.

(k) where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;

Table 4: Summary of Specialist Findings and Recommendations.

Appendix F-A: Visual Impact Assessment
The construction and operation of the proposed Solar facility and its associated infrastructure will have a visual impact on the scenic resources of this region. The solar facility infrastructure will be visible within an area that is generally seen as having a high quality natural and scenic landscape and a resultant tourism value and potential. The infrastructure would thus be visible within an area that incorporates various sensitive visual receptors who would consider visual exposure to this type of infrastructure to be intrusive. The rocky outcrops and open space of the Greater Karoo is of scenic beauty, and the proposed solar facility is expected to transform the natural character of this area for the entire operational phase of the infrastructure. In addition, the tourism value of the region must not be overlooked, specifically its location within Greater Karoo. There are not many options as to the mitigation of the visual impact of the solar facilities. The infrastructure extent exceeds at least 4 km² and vegetation screening or landscaping would only partly be able to hide structures of these dimensions. In term of the Alternatives, all three alternatives will be visually exposed to large areas within their respective 10km offsets. This is due to the extent and dimension of the infrastructure associated with solar facilities. Overall, considering all relevant criteria, **Alternative 2** is considered the **preferred alternative**, and is recommended from a visual perspective. However, both Alternatives 1 and 3 would be acceptable should Alternative 2 not be viable due to other constraints. **Mitigation Measures to be included in EMPr** The following (as detailed in section 6.7) is also recommended: • Mitigate secondary visual impacts associated with the construction of roads by using existing roads wherever possible. Where new roads are required, these should be planned carefully, taking due cognisance of the topography. Roads should be laid out along the contour wherever possible, and should never traverse slopes at 90 degrees. Construction of roads should be

undertaken properly, with adequate drainage structures in place to forego potential erosion problems.

- Access roads which are not required post-construction or later, post decommissioning should be ripped and rehabilitated.

- Mitigate visual impacts associated with the construction phase, albeit temporary, through proper planning, management and rehabilitation of all construction sites.

- After decommissioning, all infrastructure should be removed and all disturbed areas appropriately rehabilitated.

Appendix F-B: Heritage Impact Assessment

A number of known cultural heritage sites (archaeological and/or historical) exist in the larger geographical area within which the study area falls. Several archaeological and historical sites, features and finds were identified and recorded during the physical assessment undertaken.

A total of 36 sites were identified and recorded during the February 2017 assessment. Most of these are open-air Stone Age surface scatters of varying density and significance, while some historical sites, feature and cultural material most likely associated with the Anglo-Boer War (1899-1902) and farming history of the area was also identified. Some of the sites are located close to and within the 3 Areas where the Solar PV facilities and associated substations are planned, and mitigation measures will have to be implemented, while others are located in the general area of study as indicated by the client. The main focus of the field assessment was the 3 indicated footprint areas, although areas outside of this (in the larger impact area) were also looked at. It should once again be stressed that certain portions were inaccessible as a result of recent rains and the fact that sections contains extensive wetlands. Existing dirt tracks/roads and ESKOM servitudes were used and large portions were walked on foot. Areas with the potential for containing evidence of human presence and activity such as erosion dongas; unnatural looking clumps of trees and low outcrops or rocky ridges were focused on as well. Large parts of the study area is flat and open and has been disturbed by agricultural activities that include grazing and crop growing in the recent past and currently.

All the Stone Age sites identified during the assessment are open-air surface scatters of varying densities, with many single or more tool occurrences to extensive and very dense scatters covering a fairly large area (mainly Site 23). Many of the sites fall outside the areas of direct impact, while Site 23 (the most significant of the sites) falling in what we termed PV Plant Area 2. This site needs therefore to be mitigated. This site and others recorded during the February 2017 survey is similar to those recorded by others in the larger area during earlier assessments. They are located close to and around low rocky ridges and dolerite outcrops/dykes. Stone Age quarry sites are usually found at the foot of dolerite hills where hornfels outcrops occur. Site 23 and some of the other smaller sites seem to be so-called quarry sites, with dense scatters of flakes, more formal tools and numbers of cores occurring at these sites. Dolerite is also associated with engraving sites. One such site has been recorded at the

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Commonage in Hanover Town (Palaeo Field Services 2014: 5). Although no rock engravings were identified in the area during the assessment, some rocks with signs of edges being hammered or used were identified. Many of these are located close to sites with stone-packed enclosures though to be associated with the Anglo-Boer War period in the area, although the possibility of these features being related to earlier pastoralist camps cannot be excluded.

Sampson's (1972, 1974) survey of the Seacow drainage near Hanover recorded sites and quarries, ranging from the Earlier, Middle and Later Stone Ages, to proto-historic pastoralist camps and Historic farmyards. This culture-history sequence forms a basis for identifying stone tool industries and historic occupations over the entire district. There have been several investigations in the De Aar district itself because of the ammunition disposal plant to the west and various solar panel projects (e.g. Kaplan 2010; Kruger 2012; Morris 2011). Generally, archaeologists have found scatters of stone tools dating to the Middle and Later Stone Ages. In addition, the ammunition area yielded an Earlier Stone Age scatter, and a few rock art sites are on record for the district (Morris 1988; Rudner and Rudner 1968). These reports show that the De Aar district has a rich archaeological heritage (Huffman 2013: 3).

Surface scatters of stone tools (mostly Early and Middle Stone Age) were recorded during various earlier Heritage Impact Assessments. Of most importance to the current assessment was work conducted by Morris in 2011 for the proposed Taaibosch Photovoltaic Plant between De Aar and Hanover (David Morris 2011). He recorded a variable density of stone artifacts, mostly of Pleistocene age, over most of the area examined during the Archaeological Specialist Input for this project.

Site 23 covers an extensive area with dense scatters of Stone Age material including flakes, cores and more formal tools. Mitigation measures should include detailed mapping and drawing; surface collection of representative material as well as possible excavations. The other sites in the study area are similar but contain varying degrees of scatter density, from single tools to denser scatters. Site 23 can therefore be seen as a representation of the Stone Age in the area and detailed mitigation needs to be undertaken if the site cannot be avoided.

Many of the historical sites found during the February 2017 assessment are similar to those found by Beater during her HIA for the Taaiboschfontein Solar PV Project in 2011. She indicates that these are related to the Anglo-Boer War period and assesses their significance as of local importance and therefore worthy of preservation (Beater 2011). Most of the sites found during 2017 fall outside of the areas of direct impact, except Site 24 located in PV Plant Area 2. Site 30 is a stone cairn that could possibly be a grave (located in Area 2 as well) and care should be taken not to impact this site without proper investigation.

Farms and other historical settlements in the area date back to the 1840's, while the area also have evidence associated with the South African (Anglo Boer) War. Signs of historical occupation are common in the general area and include abandoned sheep kraals and homestead ruins (Sites 13, 35, 36). Old railway infrastructure (housing, old railway lines and foundations) was also recorded at nearby Burgervilleweg (Becker 2012).

According to Beater, during the Anglo-Boer War of 1899-1902, the De Aar/Hanover/Graaf Reinet area

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was a hive of activity. Boer forces were strong in Northern Cape as towns had been scarcely garrisoned and towns as far east as Molteno were occupied by Boer commandos. The Cape Colony was initially seen as safe as it was a British Colony but Boers from the Orange River Colony crossed into the Cape Colony and occupied several towns. The railway links between Cape Town and the interior as well as smaller railway lines were crucial for the British as they provided transport from the harbour to the interior that carried soldiers, food and other goods. Disruption of the railway line by the Boer forces during the guerrilla warfare period from 1900 was ongoing and deliberate with the Boer commandos blowing up railway lines, derailing trains, and taking supplies from the trains meant for the British forces. Between December 1900 and September 1901 135 train wrecking incidents were recorded. Due to the expanding activities of the Boer commandos in the Cape more British troops had to be detailed to guard the Cape railways and from July 1901 onwards blockhouses and redoubts were built, eventually all the way down to Wellington in the Western Cape. Lord Kitchener was also forced to divert increasing numbers of troops from the occupied Boer Republics to aid the colonial detachments in dealing with the Boer commandos. In the cemetery on the outskirts of Hanover, a pyramid of stone marks the grave of three young men executed during the Anglo-Boer War of 1899-1902. A train had been derailed and plundered at Taaibosch, 20 km from town. Shortly afterwards several young men sleeping in the outside rooms of a nearby farm were taken into custody. They were charged with 'maliciously assisting Boer forces,' robbery and the deaths of passengers. Tried on somewhat dubious authority by a military court at De Aar, Sarel Nienaber, J. P. Nienaber and J. A. Nieuwoudt, were shot. They protested their innocence to the end (Beater 2011: 12-13).

The Anglo-Boer War (1899-1902) related sites (Sites 10, 14, 19-21 & 24) should be mitigated if they are to be impacted by the proposed development actions. This will include detailed mapping and drawing of the sites, as well as limited historical-archaeological excavations. If Site 30 is a grave then the site should be avoided and no impact on it allowed. The site can be fenced-off and protected. If it cannot be avoided, then the site can be mitigated through exhumation and relocation after all due social consultation & permitting processes have been completed.

Finally, it should be noted that although all efforts are made to locate, identify and record all possible cultural heritage sites and features (including archaeological remains) there is always a possibility that some might have been missed as a result of grass cover and other factors. The subterranean nature of these resources (including low stone-packed or unmarked graves) should also be taken into consideration. Should any previously unknown or invisible sites, features or material be uncovered during any development actions then an expert should be contacted to investigate and provide recommendations on the way forward.

From a cultural heritage point of view the development should be allowed to continue, once the recommended mitigation measures have been implemented.

Mitigation Measures to be included in EMPr

Site 23 covers an extensive area with dense scatters of Stone Age material including flakes, cores and more formal tools. Mitigation measures should include detailed mapping and drawing; surface collection of representative material as well as possible excavations. The other sites in the study area

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Appendix F-C: Chiropteran Assessment (Bat Survey)

The conservation of the Nama-Karoo is largely dependent on the land use and conservation practices of privately owned land as the vast majority of vertebrate and invertebrate species are nomadic and move with the fluctuating availability of resources associated with the unpredictable nature of rainfall events. In order to conserve the Nama-Karoo, it is vital that landowners and developers understand that is valuable to conserve and maintain the diverse indigenous vegetation.

The potential impacts and recommended mitigation measures are discussed below.

Potential Impacts:

a. **The removal of vegetation and degradation of habitat resulting in the disturbance of important areas of bat activity,**

- Changes in landscape and habitat conversion can affect bat populations and assemblages on a local and regional scale (Jones *et al*. 2009, Jones *et al*. 2003, Jung and Kalko 2011).
- Large scale removal of natural vegetation for the installation and operation of solar power plants can cause a change in prey availability and thus a change in bat activity in the landscape.
- Open water in arid and semi-arid environments (such as in the Nama-Karoo) may be an important resource influencing survival, resource use, distribution and activity of insectivorous bats (Korine *et al.* 2016).
- It is important that areas with low lying depressions where water pools during the autumn and summer rainfall season are not altered as they may be important areas

not only for bats to drink and forage but also for socialising.

It is recommended that;

- As much of the natural established vegetation is conserved.
- Use pre-existing farm roads during construction. Discourage construction vehicles from driving through the natural vegetation and drainage lines were construction activities are not taking place.
- Seed disturbed areas after construction with seeds of the naturally occurring plant species to encourage invertebrate species richness.
- If possible, refrain from using herbicides to control the height of vegetation, rather use domestic stock (preferably sheep as goats tend to eat everything) to graze and browse the vegetation, however, this will need to be carefully monitored as grazing during and shortly after a drought can cause palatable plant species to die off, heavy grazing pressure in summer will favour the growth of karoid shrubs, and high grazing pressure during winter will favour the growth of perennial grasses (Mucina and Rutherford, 2006) both of which can affect insect abundance which in turn may affect bats.

b. It is important not to overgraze the vegetation in the solar plant farms as this will significantly alter plant canopies can lead to the reduction in leaf litter from the plants which is important for seed retention (Jones and Esler, 2004) and will expose the soil to erosion by both wind and water. With the loss of precious topsoil, the restoration of these areas will be difficult. **Disturbance to roosting sites during construction activities,**

- Bats are known to use a variety of roost types from rock cavities, exfoliating rock, tree foliage, under tree bark, tree cavities, aardvark burrows, natural and man-made caves and numerous man-made structures (Jones *et al* 2009, Monadjem *et al.* 2010, Voight *et al.* 2016) however, during the active search for roosts in the natural terrain, no roosting sites were located. There is a colony of bats roosting in the main farm house, but this colony will not be impacted by any solar power plant related construction activities.

It is recommended that if the solar power farm is to be installed near the numerous rocky outcrops in the southwest portion of the farm, it would be preferable for a 100m buffer zone to be extended around the area to limit any potential impact on roosting sites in the rocky outcrops.

c. Light pollution during construction and operational phase.

- Light pollution impacts both negatively and positively on bats and can alter species composition, foraging patterns, reproductive success and predation rate (Stone *et al.* 2015). Research has shown that there are open-area foraging bat populations that may benefit from feeding on insects attracted to artificial light sources (Jones *et al.* 2009, Voigt *et al.* 2016). Conversely, if artificial lighting is located close to roosting sites, the foraging emergence times of the bats can be delayed.

It is recommended that security lights/spot lights are erected only near infrastructure/where absolutely necessary and are only switched on just after the night time bat emergence (seasonally dependent).

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d. Habitat changes beneath the solar panels.

- The change in the microclimate beneath the solar panels and between the solar panels may provide different ecological conditions which may encourage or provide suitable conditions for botanical diversity (Montag *et al.* 2016). Invertebrate diversity will be influenced by botanical diversity as plants provide forage, habitat and structure for reproduction (Montag *et al.* 2016), and thus in turn may positively influence and possibly increase bat foraging activity.

Mitigation Measures to be included in EMPr

It is recommended that during the rehabilitation phase, a seed mix containing a variety of the local floral species is used and that the management practices are focused on biodiversity conservation.

Annual monitoring during preconstruction and during the operational phase will provide much needed insight into the changes in bat activity, species composition and ecology over the affected property. One-year preconstruction and two years post-construction in line with the South African Good Practice Guidelines for Surveying Bats at WEF's (Sowler and Stoffberg, 2014) and SAGPG for Operational Monitoring (Aronson *et al.* 2014) should be followed as any changes in bat activity and perceived impacts will be most evident in the first two years of operation. The time frame for post-construction monitoring thereafter can be altered. By following these guidelines, data sets that are comparable with other large-scale renewable energy projects that impact bats, can be collected and collectively used to understand the extent of the impacts of these projects and define effective mitigation strategies. (

Bat activity and trends in population numbers are of particular interest to determine the cumulative long-term effects of solar power plants, it is suggested that a passive recording monitoring system be put in place for one-year pre-construction and two years post construction. These systems are to be maintained by a specialist to determine the impacts of solar power plants on bat populations in relation to landscape changes in both the physical changes with the installation of the PV panels, the resulting change in vegetation structure underneath the PV panels and the management strategy of the operational facility.

No specialist species of bats were identified during the field study, nonetheless, with additional deterioration to the landscape and the loss of habitat due to vegetation clearing may cause a shift in the species composition within the bat community to a bias towards more hardy species such as the Egyptian free-tailed bat.

The rehabilitation and management of the operational solar power plant will be a critical activity as this will have a direct impact on biodiversity and ecosystem functioning.

In my opinion, based on the data collected during the bat baseline survey and available literature, there is little reason from a chiropteran perspective for the development of the proposed Soventix Solar Farm not to be approved.

Appendix F-D: Grazing, soils and wetland Impact Assessment

The study areas are dominated by the Mispah and Swartland soil forms. Sub dominant soil forms are Glenrosa, Hutton, Valsrivier and Oakleaf. Ten soil forms have been identified from 122 soil observation sites. The majority of the soils are very shallow (around 15-30cm) with only a small minority of soils deeper than 120cm. Clay content ranges from sandy to very clayey. Calcareous soils are covering

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relative small areas with only focus area B that has a significant area of 105.6 ha (class 8 on the soil map) that is dominated by these soils. The median effective rooting depth of only 20cm for focus areas A and B and even less at 15cm for area C implies that even with irrigation the soils are unsuitable for most types of agriculture. Extensive grazing with relative low animal numbers is the most suitable agricultural application.

No severe donga erosion has been observed in the study areas. Minor to moderate plate erosion is present in all three main study areas. The three study areas are separated by floodplains that contain seasonal to temporary wetland systems. Severe donga and sheet erosion have been observed on these flood plains.

There are no significant wetlands present in the three main study areas. The most conspicuous wetlands are small artificial permanent wetlands around watering points. There is no major flood danger inside the study areas except for a small southern portion of focus area B that overlaps with the edge of the floodplain. However, the adjacent flood plains are characterised by severe flooding during some rainy seasons.

It is not envisaged that the proposed development will result in major soil erosion or any other degradation of the soils of the focus areas provided that there is proper runoff management from roads and other bare areas. The shallow soils may present a challenge for some construction items like poles that need to be planted. The clayey soils and most noticeably the Valsrivier soils may restrict vehicle movement during the wet season. It is possible that the shading effect of the proposed solar panels will increase soil moisture content and therefore improve the general grazing capacity of the study areas.

Appendix F-E: Traffic Impact Assessment

The following conclusions were made;

Traffic volumes along the N10 was obtained from SANRAL. These volumes indicate that the N10 carries very little traffic past the proposed site.

The anticipated traffic volumes that will be generated during the construction and operational phases of the project will have an insignificant impact on the road network.

The location of the access need to comply with the sight distance standards set out in the G2 manual.

It is not foreseen that any additional turning lanes to constructed at the access.

Mitigation Measures to be included in EMPr

The exact position of the access needs to be approved by SANRAL.

Appendix F-F: Social Impact Assessment

Recommendations regarding Corporate Social Responsibility Projects (CSR)

Corporate social responsibility (CSR) is a form of corporate self-regulation incorporated into a business model. CSR policy functions as a built-in, self-regulating mechanism whereby a business monitors and ensures its active compliance with the spirit of the law, ethical standards, and international norms. Through the RFP document the Department of Energy (DoE), requires that all renewable energy bidders must illustrate how the Project will benefit the local community. This must be done through:

- Enterprise development; and
- Socio-economic development.

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When considering potential projects to invest in, Soventix should keep in mind that social development is a long-term process, and not something that can be achieved in a couple of years. The recommendation is therefore that Soventix identifies a sustainable project that they can be involved with and grow throughout the life of their project. Given that enterprise and socio-economic development are not the core business of Soventix, the best option is to liaise with a local NGO/NPO that have the expert knowledge on how to implement these kinds of projects. This will ensure that money and resources are not wasted, but used optimally from the start of the project. The Karoo Eisteddfod Trust (www.karooeisteddfod.com) is a multidimensional educational and development NPO based in De Aar, but operating not only in De Aar, but across the Karoo in Hanover, Phillipstown and Victoria West. The organisation has a proven auditable track record of the successful implementation of projects. Their programmes aim to address the inequities of Apartheid and help disadvantaged young people to realise their potential. Their model supports children from infancy into adulthood. As such, the NPO has extensive knowledge about the socio-economic needs of people in the region. It is recommended that when Soventix is ready to investigate CSR projects that they should contact this NPO to assist them with identifying local needs and projects and link them with other NPOs in the region.

Stakeholder Engagement Plan

Social impacts already start in the planning phase of a project and as such it is imperative to start with stakeholder engagement as early in the process as possible. A stakeholder engagement plan will assist Soventix to outline their approach towards communicating in the most efficient way possible with stakeholders throughout the life of the project. Such a plan cannot be considered a once off activity and should be updated on a yearly basis to ensure that it stays relevant and to capture new information. Stakeholders must provide input in the Stakeholder Engagement Plan.

The Soventix Stakeholder Engagement Plan should have the following objectives:

- To identify and assess the processes and/or mechanisms that will improve the communication between local communities, the wider community and Soventix.
- To improve relations between Soventix staff and the people living in the local communities.
- To provide a guideline for the dissemination of information crucial to the local communities in a timely, respectful and efficient manner.
- To provide a format for the timely recollection of information from the local communities in such a way that the communities are included in the decision-making process.

The Stakeholder Engagement Plan should be compiled in line with International Finance Corporation (IFC) Guidelines and should consist of the following components:

- Stakeholder Identification and Analysis – time should be invested in identifying and prioritising stakeholders and assessing their interests and concerns.
- Information Disclosure – information must be communicated to stakeholders early in the decision-making process in ways that are meaningful and accessible, and this communication should be continued throughout the life of the project.
- Stakeholder Consultation – each consultation process should be planned out, consultation

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should be inclusive, the process should be documented, and follow-up should be communicated.

- Negotiation and Partnerships – add value to mitigation or project benefits by forming strategic partnerships and for controversial and complex issues, enter into good faith negotiations that satisfy the interest of all parties.
- Grievance Management – accessible and responsive means for stakeholders to raise concerns and grievances about the project must be established throughout the life of the project.
- Stakeholder Involvement in Project Monitoring – directly affected stakeholders must be involved in monitoring project impacts, mitigation and benefits. External monitors must be involved where they can enhance transparency and credibility.
- Reporting to Stakeholders – report back to stakeholders on environmental, social and economic performance, both those consulted and those with more general interests in the project and parent company.
- Management Functions – sufficient capacity within the company must be built and maintained to manage processes of stakeholder engagement, track commitments and report on progress.

It is of critical importance that stakeholder engagement takes place in each phase of the project cycle and it must be noted that the approach will differ according to each phase. The stakeholder analysis done in Section 6 of this report must inform the stakeholder engagement strategy.

Proposed Grievance Mechanism

In accordance with international good practice Soventix should establish a specific mechanism for dealing with grievances. A grievance is a complaint or concern raised by an individual or organisation that judges that they have been adversely affected by the project during any stage of its development. Grievances may take the form of specific complaints for actual damages or injury, general concerns about project activities, incidents and impacts, or perceived impacts. The IFC standards require Grievance Mechanisms to provide a structured way of receiving and resolving grievances. Complaints should be addressed promptly using an understandable and transparent process that is culturally appropriate and readily acceptable to all segments of affected communities, and is at no cost and without retribution. The mechanism should be appropriate to the scale of impacts and risks presented by a project and beneficial for both the company and stakeholders. The mechanism must not impede access to other judicial or administrative remedies.

The grievance mechanism should be based on the following principles:

- Transparency and fairness;
- Accessibility and cultural appropriateness;
- Openness and communication regularity;
- Written records;
- Dialogue and site visits; and
- Timely resolution.

Based on the principles described above, the grievance mechanism process involves four stages:

- Receiving and recording the grievance;
- Acknowledgement and registration;
- Site inspection and investigation; and
- Response.

The Grievance Mechanism should be communicated to all stakeholders.

Mitigation Measures to be included in EMPr

Based on the findings of this study, the following key recommendations are made:

- Mitigation about safety and security must be implemented as soon as construction commences. The process must involve local security groups and landowners;
- A community liaison officer that is trusted by the community and has the necessary skills and education must be appointed before construction commences;
- Protocols on farm access, compensation, communication and road maintenance must be agreed upon and be in place before construction commences;
- A grievance mechanism and claims procedure must be in place and shared with all the stakeholders before the construction commences; and
- Economic benefits must be enhanced, and local labour and procurement should be prioritised.

None of the social impacts identified are so severe that the project should not continue. Based on the findings of this report, it is recommended that the project continues, on the conditions that the mitigation measures are implemented.

Appendix F-G: Fauna & Flora Impact Assessment

The Soventix site consists of areas of contrasting sensitivity, which is driven by the presence of the Brak River system at the site and a series of dolerite outcrops which are considered high sensitivity in comparison with the open plains of the site which are comparatively low sensitivity. This pattern is the main driver of the sensitivity of the site and the consequent development potential of the PV target areas. Although there are probably sufficient areas of low sensitivity present at the site to accommodate the full project, the indicated target areas do not always align with the lower sensitivity areas and the project will either have to reduce the development footprint to within the lower sensitivity areas or alternatively expand into low sensitivity areas that are currently outside of the demarcated target areas.

The major sensitive feature of the broader site is the Brak River system which has extensive silty floodplains that are occasionally inundated. Within each PV area there are also some dolerite ridges and outcrops which are considered sensitive and unsuitable for development. These occupy different proportions of each PV area and will have the greatest impact on the PV1 development area. The low-lying plains in the west of PV3 are also considered sensitive due to the movement of water through this area and its function as a seasonal wetland and area of high productivity. These constraints will result in the loss of up to half of the proposed development footprint of each facility.

The primary and critical mitigation measure required to reduce impacts associated with the

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development to an acceptable level is the avoidance of areas demarcated as High Impact and No-Go areas. Significant infrastructure in these areas would potentially be a fatal flaw and compromise the viability of the project. However, due to the contrasting sensitivity of the site, there are also fairly extensive low sensitivity areas present where ecological impacts are likely to be low. The abundance of fauna and flora species of conservation concern in these areas is low and impacts would be of a local nature only. Development of PV facilities in the lower sensitivity areas would generate low impacts which are considered acceptable and which can be reduced due low significance through the recommended mitigation and avoidance measures.

Provided that the development can be restricted to the medium and lower sensitivity parts of the site, then the development of the three PV plants at the Soventix site would generate low impacts of an acceptable magnitude. As such, development of the lower sensitivity parts of the site can be supported from a terrestrial ecological perspective.

Mitigation Measures to be included in EMPr

Planning & Construction Phase

Impacts on vegetation and listed plant species

- The areas demarcated as high impact and no-go areas must be avoided in order to retain acceptable levels of impact.
- Preconstruction walk-through of the facility in order to locate species of conservation concern that can be translocated as well as comply with the provincial and DAFF permit conditions.
- Vegetation clearing to commence only after walk through has been conducted and necessary permits obtained.
- Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc.
- ECO to provide supervision and oversight of vegetation clearing activities within sensitive areas such as near drainage areas.
- All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area.
- Temporary lay-down areas should be located within previously transformed areas or areas that have been identified as being of low sensitivity. These areas should be rehabilitated after use if they do not fall within the development footprint of the plant infrastructure.

Direct Faunal Impacts During Construction

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- All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often persecuted out of superstition.
- Any fauna threatened by the construction activities should be removed to safety by the ECO or appropriately qualified environmental officer.
- All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises.
- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
- If trenches need to be dug for electrical cabling or other infrastructure, these should not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches which are standing open should have places where there are soil ramps allowing fauna to escape the trench.

Soil erosion and associated degradation of ecosystems during construction

- Dust suppression and erosion management should be an integrated component of the construction approach.
- Disturbance near to drainage lines should be avoided and any drainage areas near to access roads and construction activities should demarcated as no-go areas.
- Regular monitoring for erosion problems along the access roads and other cleared areas.
- Erosion problems should be rectified on a regular basis.
- Sediment traps may be necessary to prevent erosion and soil movement if there are topsoil or other waste heaps present during the wet season.
- A low cover of vegetation should be left wherever possible within the construction footprint to bind the soil, prevent erosion and promote post-disturbance recovery of an indigenous ground cover.

<u>Operational Phase</u>

Alien Plant Invasion Risk During Operation

- Wherever excavation is necessary, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species.
- The recovery of the indigenous vegetation should be encouraged through leaving some areas intact through the construction phase to create a seed source for adjacent cleared areas.

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- Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem on parts of the site and a long-term alien control plan will need to be implemented.

- Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as these are also likely to be prone to invasion problems.

- Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.

Soil erosion and associated degradation of ecosystems

- All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk.

- Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance.

- All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.

- All cleared areas should be revegetated with indigenous perennial grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.

Faunal impacts during operation

- No unauthorized persons should be allowed onto the site.

- Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location.

- The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden.

- If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects.

- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.

- All vehicles accessing the site should adhere to a low speed limit (30km/h max) to avoid collisions with susceptible species such as snakes and tortoises.

- If the facility is to be fenced, then the electrified strands should be on the inside of the fence as some species such as tortoises are susceptible to electrocution from electric fences as they do not

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move away when electrocuted but rather adopt defensive behaviour by retreating into their shells and are killed by repeated shocks.

Decommissioning Phase

Alien Plant Invasion Risk During Decommissioning

- The recovery of the indigenous vegetation should be encouraged after the closure of the development.
- Regular alien clearing should be conducted throughout all project phases using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.

Soil erosion and associated degradation of ecosystems

- All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.
- All cleared areas should be revegetated with indigenous perennial grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.

Faunal impacts during decommissioning

- Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location.
- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
- All vehicles accessing the site should adhere to a low speed limit (30km/h max) to avoid collisions with susceptible species such as snakes and tortoises.

Cumulative Impacts

Impact on CBAs and biodiversity pattern and process within the CBAs

- Minimise the development footprint as far as possible and buffer the Brak River from impact as much as possible.
- The facility should be fenced off in a manner which allows fauna to pass through the facility as easily as possible. This implies not fencing-in large areas of intact vegetation into the facility and only the developed area should be fenced. This should be a single and not a double fence and should be electrified on the inside only.

Impact on broad-scale ecological processes

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- Minimise the development footprint as far as possible and allow the retention of some natural vegetation between the rows of panels or trackers.

- The facility should be fenced off in a manner which allows fauna to pass by the facility as easily as possible. This implies not fencing-in large areas of intact vegetation into the facility and only the developed area should be fenced.

***Appendix F-H: Avifauna* Assessment**

The study area lies within the eastern extreme of the Nama Karoo Biome, where this meet the ecotone with the Grassland Biome. Although this region appears typical of much of the upper Nama Karoo, it supports populations of several red-listed species. Many of these are medium to large terrestrial birds (cranes, bustards, korhaans) and large raptors which occur in good numbers throughout the year. The study area and broader impact zone of the proposed development are therefore considered important for the conservation of these species.

The proposed Soventix solar facility has the potential to have a medium to high impact on the avifauna of the study area. The priority species in particular are at risk since most of these are susceptible to associated threats. The primary impacts that the proposed development will have include 1) a medium displacement impact caused by habitat loss and disturbance associated with construction and maintenance activities, 2) a medium impact related to avian collisions with solar panels and power line infrastructure, and 3) a medium to low impact related to cumulative habitat loss at a broader scale from renewable energy development in the wider area.

Several mitigation measures can be implemented during the construction and maintenance phase of the proposed development to reduce the impacts on the avifauna. Mitigation measures may assist in reducing the impacts associated with power line electrocutions and collisions with solar panels and power line infrastructure, and should be implemented as far as possible. Regular monitoring of these impacts should be undertaken to determine high risk areas where further mitigation can be implemented, and to contribute to a better understanding of the interactions between birds and solar facilities.

Some protected species are present, but these are relatively widespread species and the impact on these species could be reduced by the proposed mitigation measures, specifically buffering nests, water bodies and avoiding rocky outcrops and other higher sensitivity areas, as well as ensuring bird-friendly PV layouts and fixing bird flappers onto powerlines where present. The development is likely to have an impact on avifauna, especially during the construction phase, but in the long term, it is likely that most species will be able to continue to utilise the site and any impacts on avifauna would be of local significance only.

The broad area around the site has a large amount of renewable energy development, from both wind and solar development, increasing the potential significance of cumulative impacts at the site. However, the plains around the site are still largely undeveloped and the three proposed development areas are separated by some distance, which would facilitate movement of avifauna and allow for use of the intervening areas. The overall Avifaunal Specialist EIA Report 37 Soventix Solar PV Facility

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impact on landscape connectivity is likely to be low, especially given the largely intact nature of the surrounding landscape.

With mitigation and specifically the strict avoidance of the high sensitivity areas, the identified avifaunal impacts can be reduced to an acceptable level. While there are certainly some sensitive areas at the site that need to be avoided, there are also fairly of lower sensitivity plains present, where development should be focussed. As these plains are extensive, the extent of habitat loss resulting from the development of the PV facilities at the site is considered low and would not be likely to pose a threat to the long-term persistence of any avifauna at the site. With the implementation of these mitigation measures, the impact of the development can be reduced to an acceptable level and as such there are no fatal flaws associated with the development that should prevent it from proceeding. A final caveat is however that a power line layout has not been provided for the assessment and this could potentially have a significant impact on the current assessment should a long power line be required.

Planning & Construction Phase

Mitigation/Management Actions: Avifaunal Habitat loss impacts

- Avoid the high sensitive portions of the layout for each PV Plant site as indicated in the sensitivity map, such as the dolerite ridges, water bodies and raptor nests. The destruction of habitat during construction should also be strictly contained within the direct footprint of the development. Water bodies and nests should be buffered by 1km radius.
- The use of lay-down areas within the footprint of the development should be used where feasible during construction, to avoid habitat loss and disturbance to adjoining areas.
- All building waste produced during the construction phase should be removed from the development site and be disposed of at a designated waste management facility. Similarly, all liquid wastes should be contained in appropriately sealed vessels/ponds within the footprint of the development, and be disposed of at a designated waste management facility after use. Any liquid and chemical spills should be dealt with accordingly to avoid contamination of the environment.
- Only existing roads should be used as far as possible to avoid the unnecessary construction of new roads.
- Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc.
- All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area.
- The number of vehicle using access and maintenance roads should also be minimised, to keep disturbances to an absolute minimum.
- Sensitive microhabitats should be avoided, such as nesting sites during the breeding season of large terrestrial birds (generally during summer; Hockey et al., 2005).
- Mitigation/Management Actions Disturbance impacts on avifauna and listed bird species during

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Construction.

- No construction activity should occur near to active raptor nests. If there are active nests near construction areas, they should be monitored until the birds have finished nesting and the fledglings left the nest.
- All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming species such as owls which are often persecuted out of superstition.
- All construction vehicles should adhere to a low speed limit to avoid collisions.
- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.

Operational Phase

Mitigation/Management Actions: Avifauna collisions with PV panels

- The layout of solar arrays should be placed so as to avoid bird flight paths between focal points such as water bodies, foraging and roosting sites.
- It has been suggested by Visser (2016) that collision mortality could be reduced at solar facilities by using 28 cm-spaced contrasting bands or 10 cm spatial gaps between solar panels. This enables birds, particularly water birds, to differentiate the expansive layout of panels as a solid structure, reducing the likelihood that they may try to land and collide with the panels. These recommendations should therefore be incorporated into new solar facilities until further research into panel design and layout suggests otherwise.
- All incidents of collision with panels should be recorded as meticulously as possible, including data related to the species involved, the exact location of collisions within the facility, and suspected cause of death. Post-construction monitoring with the aid of video surveillance should be considered, as this will contribute towards understanding bird interactions with solar panels.

Mitigation/Management Actions: Avifaunal impacts from disturbance and operational activities

- If birds are nesting on the infrastructure of the facility and cannot be tolerated due to operational risks of fire, electrical short, soiling of panels or other problems, birds should be prevented from accessing nesting sites by using mesh or other manner of excluding them. Birds should not be shot, poisoned or harmed as this is not an effective control method and has negative ecological consequences. Birds already with eggs and chicks should be allowed to fledge their chicks before nests are removed.
- If there are any persistent problems with avifauna, then an avifaunal specialist should be consulted for advice on further mitigation.
- All food waste and litter at the site should be placed in bins with lids and removed from the site on a regular basis.
- If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects. The use of lighting at

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night should be kept to a minimum, so as not to unnecessarily attract invertebrates to the solar facility and possibly their avian predators, and to minimise disturbance to birds flying over the facility at night.

- Any movements by vehicle and personnel should be limited to within the footprint of power lines and other associated infrastructure, especially during routine maintenance procedures. Utmost care should be taken to not disturb nests that may be constructed on power line structures.
- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
- All vehicles accessing the site should adhere to a low speed limit (30km/h max) to avoid collisions with susceptible species.

Decommissioning Phase

Mitigation/Management Actions: Avifauna impact from disturbance

- All personnel should undergo environmental induction with regards to avifauna and in particular not disturbing or harming birds.
- If there are active nests at the site at decommissioning, these should be left along until the birds have finished breeding.
- All construction vehicles should adhere to a low speed limit (50km/h) to avoid collisions with susceptible species.
- All litter and rubble from decommissioning should be cleaned up and removed from the site.
- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.

Cumulative Impacts

Mitigation/Management Actions: Habitat fragmentation and negative impacts on IBAs

- Development in the higher sensitivity areas and habitats must be avoided.
- Impacts on avifauna must be monitored and reported to authorities on an annual basis.
- If all three PV developments are constructed, then an offset area at the site should be identified and set aside for conservation-orientated use. It is recommended that this could be the western-most section of the site including the plains along the N10 and the adjacent dolerite hills.

Appendix F-I: **Geotechnical Assessment**

For solar panels overturning moment will be the main load on the solar panel structure support columns and excavation to 1,0 metres below natural ground level will probably be required to ensure overturning stability.

4.1. Due to hardness of, and shallow depth to dolerite bedrock, drilling/digging for placement of footing columns and digging of trenches for laying of cables will be difficult. The fact that moderately steep surface slopes occur over large parts of the areas underlain by dolerite sills, may further contribute to construction difficulties in these areas. It is thus recommended that no solar panels be erected in areas underlain by dolerite sills. (Since dolerite dykes are thin and thus do not cover pronounced surface areas, the non-construction recommendation does not include areas underlain by dolerite dykes).

4.2. Those areas of the sites not underlain by dolerite bedrock are largely underlain by soft to medium hard rock sandstone/siltstone at depths of less than 0,5 metres below ground level. Considering the time-consuming nature of pad footing construction (breaking out and removal of rock and casting of reinforced concrete), and furthermore the difficulty which rock mass at depths shallower than 1,0 m will cause to placement of screwed piles, rammed piles is considered the most effective support option for solar panels. However, since driving to at least 1 metre depth, may prove difficult over large parts of the site (where rock mass depths are < 0,5 metres), as an alternative, ground beam concrete footings (which make use of concrete strip footings at very shallow depth below ground level to act as support and counterweight for solar panels) may possibly have to be utilized. This founding option is expected to be considerably costlier than using of piles.

The southwestern portion of Site B (the vicinity of the planned Eskom sub-station and directly north and northwest thereof) is considered the only part of any of the sites with a thick enough soil horizon to possibly allow effective rammed pile installation to 1,0 m depth.

4.3. Drainage channels of episodic rivers and very low surface slopes as well as large drainage control berms occur along (or in close proximity to) the southern border of Site B and the eastern border of Site C. This indicate that submerged conditions may occur for short periods in those areas during the rainy season. Consequently, access roads in those areas will have to be supplied with properly designed and constructed gravel surfaces with a positive elevation to allow vehicular passage during periods of submersion.

4.4. If commercially available sources of concrete aggregate prove to be too distant and expensive for utilization on site, unweathered dolerite rock which occurs in abundance on each of the sites can be considered for this purpose. The dolerite will have to be tested for quality purposes and, if found satisfactory, a rock breaking plant will have to be established on site.

4.5. Dormant (or intermittently producing) sandstone quarries on the sites can be considered as sources of road layer material. Due to the slaking behaviour of mudstone/shale, care should be taken that these sediments, which occur interlayered as minor component within the sandstones, are excluded from use.

4.6. The Eskom substations for Sites A and C are planned for areas having rock outcrop (sandstone/dolerite at Site A and dolerite at Site C), whilst the planned substation for Site B occurs in an area which may be inundated during parts of the wet season. These aspects need to be considered during the design and construction of the sub-stations.

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Mitigation Measures to be included in EMPr

Preference should be given to the use of dolerite rock as construction material, however, sedimentary rock may be used with caution for the lower road layers – especially the sandstones and also mudstone/shale which have been backed by dolerite intrusions.

It is thus recommended that no solar panels be erected in areas underlain by dolerite sills. (Since dolerite dykes are thin and thus do not cover pronounced surface areas, the non-construction recommendation does not include areas underlain by dolerite dykes).
Since driving to at least 1 metre depth, may prove difficult over large parts of the site (where rock mass depths are < 0,5 metres), as an alternative, ground beam concrete footings (which make use of concrete strip footings at very shallow depth below ground level to act as support and counterweight for solar panels) may possibly have to be utilized.

Drainage channels of episodic rivers and very low surface slopes as well as large drainage control berms occur along (or in close proximity to) the southern border of Site B and the eastern border of Site C. This indicate that submerged conditions may occur for short periods in
those areas during the rainy season. Consequently, access roads in those areas will have to be supplied with properly designed and constructed gravel surfaces with a positive elevation to allow vehicular passage during periods of submersion.

***Appendix F-J: Hydrological* Assessment**

Construction phase mitigation measures

- No pylons should be located within an area that would be expected to become inundated during a 1:100 flood event.
- The area of disturbance should be kept to a minimum to allow clearing of the construction right of way. The width of the construction corridor should be kept to a minimum.
- Vegetation should be removed only where essential for the continuation of the powerline. Any disturbance to the adjoining natural vegetation cover or soils should not be allowed.
- Vegetation and soil should be retained in position for as long as possible, and should only be removed immediately ahead of construction / earthworks in any specific area.
- Existing roads should be used for access as far as possible.
- The duration of construction activities at each pylon site should be minimised as far as is practical.
- Drip trays should be placed under any activity requiring active lubrication or oiling at the pylon sites.
- Spill clean-up kits should be available on site for immediate remediation of any spills and removal of contaminated soils.
- No fuel should be stored at the pylon sites and no refuelling or servicing of construction plant should take place at the construction sites.
- No construction materials should be disposed of within the delineated wetlands or within the 100m buffer zone on the watercourse.
- No concrete batching should take place within the delineated wetlands or within the 100m buffer zone.
- All surplus spoil material from the foundation excavations (i.e. not used as backfill) should be removed from the site as soon as is practically possible.

Storm water management and erosion control measures should be implemented.
These should include the following:

- The excavated soil should be placed on the upstream side of construction activities in order to act as a

storm water diversion berm.

- Where such diversion berms create concentrated flows, as well as in steep and/or sensitive areas (such as wetlands) the use of swales, silt fences or other effective erosion control measures is recommended to attenuate runoff.
- All storm water management measures should be regularly maintained.

Once construction at a pylon site is complete, the site should be rehabilitated immediately by removing all waste material. The rehabilitation specification should be determined by the soils and vegetation specialists.

- All waste material should be removed to a licensed waste disposal facility, if it cannot be re-used or recycled.
- In areas where construction activities have been completed and no further disturbance is anticipated, rehabilitation and re-vegetation should commence as soon as possible.
- Replanting activities should be undertaken at the end of the dry season (middle to end September) to ensure optimal conditions for germination and rapid vegetation establishment.
- Should plants not successfully establish within two growing seasons after the first planting, new plant material should be provided.
- A weed and alien invasive species control plan should be implemented during the contract period.
- Any erosion channels developing during or after the construction period should be appropriately backfilled (and compacted where relevant) and the areas restored to a condition similar to the condition before the erosion occurred.

A construction method statement should be compiled and approved prior to the commencement of construction activities. The method statement should take cognisance of:

- The mitigation measures outlined above, as well as mitigation measures specified by each of the environmental specialists.
- The conditions of the Environmental Authorisation and Integrated Water Use License.
- The Environmental Management Program (EMPr) for the project submitted as part of the Environmental Impact Assessment Report.
- The Environmental Control Officer (ECO) must ensure that the contractor adheres to the above-mentioned documents.

Operational phase mitigation measures

- No pylons should be located within an area that would be expected to become inundated during a 1:100 flood event.
- Existing roads should be used for access as far as possible.
- The powerline route should be regularly inspected during the operational phase.
- Any erosion channels developing during or after the construction period should be appropriately backfilled (and compacted where relevant) and the areas restored to a condition similar to the condition before the erosion occurred.

***Appendix F-K: Aquatic* Assessment**

Construction phase mitigation measures;

Impacts on water quality: Erosion and Sedimentation that leads to increased turbidity and siltation of aquatic habitats. Chemical pollution of the water resources.

- The objective of a Storm Water Management Plan (SWMP) is to control storm water runoff from the site. It should be designed to improve the storm water

quality (i.e. sediment removal) and control runoff directly being discharged from the designated site. Disturbance of the natural topography and vegetation cover should be minimised. The natural contours should be preserved as far as is practical in order to preserve the existing site drainage patterns as far as possible. Natural, dispersed, drainage should be encouraged, by maintaining the natural drainage characteristics of the land as far as possible, thereby minimising the concentration of flows and consequently the risk of erosion. Diversion of upslope surface runoff around the solar PV area should be considered. Berms and/or open drains can be provided for this purpose. The size and lining of the drain would be dependent on the peak flow rates and velocities, which should be determined through hydrological modelling. Domestic livestock should be excluded from areas under rehabilitation for at least the first year of recovery.

- Sites of oiling and refuelling points to be located away from rivers, surface water sewers or other watercourses. Mitigated by controlled re-fuelling points, use of bio-degradable hydraulic oils, spill kits, etc. No fuel storage, refuelling, vehicle maintenance / washing, or vehicle depots should be allowed within 50 m of the edge of any wetlands or watercourses. Refuelling and fuel storage areas, and areas used for the servicing, washing or parking of vehicles and machinery, should be located on impervious bases and should have bunds around them. Bunds should be sufficiently high to ensure that all the fuel kept in the area will be captured in the event of a major spillage. If construction areas are to be pumped of water (e.g. after rains), this water should be pumped into an appropriate settlement area, and not allowed to flow straight into any watercourses or wetland areas. An emergency protocol must be developed that deals with accidents and spills. This must include methods for absorbing chemicals / oils / fuel, and the transport and disposal of all contaminated material in a suitable hazardous waste site.
- Effluent will be generated from the on-site sanitation facilities and treated by way of a BiorockTM waste water treatment package plant. The BiorockTM Waste Water Treatment Package Plant (WWTPP) will treat the water to the requisite standard before the water is disposed of via a seep-away. However, the proponent may choose in the future to further treat the water for reuse, in which case the storage (also in a JoJo tank) will not exceed 5m3, as the daily anticipated operational usage that will generate effluent, will not exceed 2m3. The quality of the treated effluent will be of such a standard that it will not impact any groundwater resource detrimentally. The potential storage of treated effluent will be well short of the minimum threshold. The BiorockTM and potential future storage unit will be outside of any watercourses, as the full development footprint has been excluded from watercourses, including a 100-metre buffer zone.

Impacts on water quantity (surface flows and groundwater):

- The existing borehole and windmill facility is located on the north-central portion of Area B outside of the delineated watercourse. The project will require 3000m3 per year for the 18-month construction period and thereafter 850m3 per year for the operational phase. These volumes fall well within the permissible limits. The five (5) storage vessels totalling 100m3 storage capacity, are all off-channel and above-ground.

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Changes in riverine habitat structure and function;

- Disturbance of the natural topography and vegetation cover should be minimised. The natural contours should be preserved as far as is practical in order to preserve the existing site drainage patterns as far as possible. The results of the analysis indicate that the water level in the watercourse is not expected to reach the pylon of concern, at its currently indicated location. The impact on water quality of the construction and operation of the power line between the solar PV array and the existing Eskom 400 kV power line is expected to be LOW prior to mitigation, reducing to VERY LOW with the implementation of the proposed mitigation measures.
- Roads should preferably not be raised above the natural base level, allowing surface runoff to flow uninterrupted. Crossings over water-courses and wetlands should rather be built as stabilised drifts than using culverts or pipes. Roads should preferably not be raised above the natural base level, allowing surface runoff to flow uninterrupted. Crossings over water-courses and wetlands should rather be built as stabilised drifts than using culverts or pipes.

Introduction of invasive alien biota.

- Control exotics and invasive plants to be eradicated . Control involves killing the plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion. Any materials brought in to construction sites should be from sources free of invasive alien species. Clearing of invasive alien plants must take place coupled with the sowing of seeds of indigenous species to stabilise disturbed habitats. Compacted bare ground should be loosened and pitted, and covered with branches or stones. This will improve the ability of the surfaces to trap seeds and to absorb rainwater, thereby hastening vegetation recovery.

Impacts on water quality: Erosion and Sedimentation that leads to increased turbidity and siltation of aquatic habitats.

- Drifts should be constructed from concrete or grouted stone pitching. Drifts should be provided at frequent spacings (recommendation is 300 m, again to minimise the concentration of flows. All storm water drainage discharge points should be provided with outlet structures, designed with adequate erosion protection, to ensure that storm water is discharged from formal structures onto the natural ground at a safe and acceptable velocity. Use existing bridges for watercourse or wetland crossings wherever possible. Minimise new crossings over wetlands and watercourses. If wetlands or watercourses cannot be avoided, ensure that road crossings are constructed using riprap, gabion mattresses, and/or other permeable material to minimise the alteration of surface and sub-surface flow. Flow of water under roads must be allowed to occur without leading to concentration of surface flow. This can be achieved through designing bridges that span the entire width of aquatic ecosystems where possible, or laying down pipes or culverts to ensure connectivity and avoid fragmentation of surface aquatic ecosystems. Bank stabilisation measures (gabions, eco logs, geofabric, sediment fences) are required when wetland or watercourse banks steeper than 1:5 are denuded during construction. Ensure erosion control along roads. Put in culverts at

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drainage lines. Build water diversion structures at 20 to 50 m intervals (depending on the steepness of the slope) along veld tracks. Soil should be dug out across veld tracks and used to create berms downslope of the ditch. Berms must be at least three times the width of the road, to prevent water running around the berm and back onto the tracks. Berm ends should be extended on the downslope side of the road with rocks to prevent diverted water eroding the soil. These will prevent veld roads acting as water channels, causing donga erosion. It will also facilitate vegetation recovery on closed roads. Storm water runoff off all roads must be spread as much as possible, to avoid concentration of flows off compacted or hardened surfaces.

Rehabilitation (DWS, 2016)

(1) Rehabilitation as contemplated in paragraph 6(1)(v) above must be conducted in terms of a rehabilitation plan and the implementation of the plan must be overseen by a suitably qualified SACNASP professional member.

(2) Upon completion of the construction activities related to the water use –

(a) a systematic rehabilitation programme must be undertaken to restore the watercourse to its condition prior to the commencement of the water use;
(b) all disturbed areas must be re-vegetated with indigenous vegetation suitable to the area; and
(c) active alien invasive plant control measures must be implemented to prevent invasion by exotic and alien vegetation within the disturbed area.

(3) Following the completion of any works, and during any annual inspection to determine the need for maintenance at any impeding or diverting structure, the water user must ensure that all disturbed areas are:
(i) cleared of construction debris and other blockages;
(ii) cleared of alien invasive vegetation;
(iii) reshaped to free -draining and non -erosive contours, and
(iv) re-vegetated with indigenous and endemic vegetation suitable to the area.

(4) Upon completion of any works, the water user must ensure that the hydrological functionality and integrity of the watercourse, including its bed, banks, riparian habitat and aquatic biota is equivalent to or exceeds that what existed before commencing with the works.

For most of the anticipated impacts on the environment during the construction phase of the dam, there are very sound mitigation measures (DWAF, 2005: Environmental Best Practice Specifications), and when implemented the process should be overseen by an Environmental Control Officer (ECO).

Buffer zones

The areas surrounding the drainage lines in the project area (Brak River and tributaries), is classified as an Ecological Support Area (ESA) and according to the Department of Environment and Nature Conservation, Northern Cape, a 100m buffer is suggested around the delineated riparian area or 100m measured from the top of bank. Buffer zones have been used in land-use planning to protect natural resources and limit the impact of one land-use on another.

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Suggestion by the Department of Environment and Nature Conservation, Northern Cape:

•Conduct a buffer determination assessment around all wetlands, regardless of ecological condition or ecosystem threat status.
•Any further loss of area or ecological condition must be avoided, including if needed, a 100m generic buffer around the wetland.

Buffer zones associated with water resources have been shown to perform a wide range of functions, and on this basis, have been proposed as a standard measure to protect water resources and associated biodiversity. These functions include:

•Maintaining basic aquatic processes;
•Reducing impacts on water resources from upstream activities and adjoining land uses;
•Providing habitat for aquatic and semi-aquatic species;
•Providing habitat for terrestrial species; and
•A range of ancillary societal benefits.

Should a buffer zone be proposed, all the planned activities will be incorporated into this zone and the purpose of the buffer zone will be futile. However, the implementation of a buffer zone to emphasize the importance of the riparian zone and adjacent dry land will certainly augment the importance of the ecology in the project area. The area included in the buffer zone, as well as the core areas in the riverine zone should have explicit and very strict biodiversity conservation management measures and the operating teams should be well aware of this.

Therefore, a buffer zone for the project is suggested on both sides of the river in order to impose a level of best practices when the proposed construction gets under way.

Any potential risks must be managed and mitigated to ensure that no deterioration to the water resource takes place. Standard management measures should be implemented to ensure that any on-going activities do not result in a decline in water resource quality.

While determining the area and distribution of a core habitat is important, it is equally important that appropriate management measures be determined to ensure the core habitat continues to function effectively. Biodiversity conservation management measures that need to be taken into consideration when determining management measures for core habitats and corridors include:

•Habitat and species management;
•Alien and invasive species management;
•Fire management;
•Grazing management; and
•The management of soil erosion and physical disturbances.

Determining the required buffer width is largely an exercise of assessing the situation and linking it to

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an acceptable level of risk. Determining appropriate management measures for aquatic impact buffer zones is largely dependent on the threats associated with the proposed activity adjacent to the water resource. These threats include:

•Increases in sedimentation and turbidity;
•Increased nutrient inputs;
•Increased inputs of toxic organic and heavy metal contaminants; and
•Pathogen inputs.

Placing of Solar PV Plant

The project team took great care to position the location and construction footprint in such a way that all the identified sensitive areas were avoided (Figure 30). This realignment of the original project footprint (preferred option Area B) incorporated the 100m buffer zone and most suitable placement of the power line pylons.

***Appendix F-L: Paleontology* Assessment**

Proposed monitoring and mitigation measures for the Soventix solar PV plant, to be incorporated into the Environmental Management Programme for the development.

No palaeontological No-Go areas or fossil sites requiring specialist mitigation have been identified within the Soventix PV solar development footprint near Hanover; fossil sites shown in Fig. 30 are rated as of low sensitivity (Proposed Field Rating IIIC). It is recommended that the older consolidated fluvial deposits along the Brak rivier be avoided during construction since they do contain fossil wood. This area lies within the riverine buffer zone and outside the proposed solar PV plant footprint.

The ECO responsible for the construction phase of the project should be aware of the potential for important fossil finds and the necessity to conserve them for possible professional mitigation (See, for example, Macrae 1999 for a well-illustrated popular account of Karoo fossils). The ECO should monitor all substantial excavations into sedimentary rocks for fossil remains on an on-going basis during the construction phase.

Recommended mitigation of chance fossil finds during the construction phase of the solar PV plant and associated grid connection involves safeguarding of the fossils (preferably *in situ*) by the responsible ECO and reporting of finds to SAHRA for the Northern Cape (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). Where appropriate, judicious sampling and recording of fossil material and associated geological data by a qualified paleontologist, appointed by the developer, may be required by the relevant heritage regulatory authorities. Any fossil material collected should be curated within an approved repository (museum / university fossil collection) by a qualified palaeontologist. These recommendations should be included within the Environmental Management Programme for the proposed alternative energy project.

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SECTION I: ENVIRONMENTAL IMPACT STATEMENT.

(l) an environmental impact statement which contains-
(i) a summary of the key findings of the environmental impact assessment:
*(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred **[site]** development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and*
(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;

Please refer to the Impact Assessment in **Appendix E.**

SECTION M: IMPACT MANAGEMENT OBJECTIVES AND IMPACT MANAGEMENT OUTCOMES (EMPR).

*(m) based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed **[impact management objectives, and the]** impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;*

Please refer to the Impact Assessment and EMPr in **Appendix E & G.**

SECTION N: FINAL PROPOSED ALTERNATIVES AND MITIGATION MEASURES.

(n) the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;

Please refer to the Impact Assessment and EMPr in **Appendix E & G.**

SECTION O: CONDITIONAL FINDINGS OF EAP AND SPECIALISTS.

(o) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation.

Please refer to **Appendix E, Appendix F and Appendix G.**

SECTION P: ASSUMPTIONS AND UNCERTAINTIES.

(p) a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;

Please refer to the Impact Assessment in **Appendix E and Appendix F.**

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SECTION q: reasoned opinion.

(q) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;

In consideration of the investigated cumulative impacts, the nature and extent of the proposed development, compliance with the relevant legal, policy and planning documentation (i.e. "need and desirability") and the findings of the specialist studies, it is the opinion of Ecoleges that the proposed Soventix Solar PV Plant development is supported from an environmental perspective and should be considered for Environmental Authorisation, subject to the implementation of the identified recommendations.

The reasoned opinions of the appointed specialists are summarised below;

Flora and Fauna Specialist

Provided that the development can be restricted to the medium and lower sensitivity parts of the site, then the development of the three PV plants at the Soventix site would generate low impacts of an acceptable magnitude. As such, development of the lower sensitivity parts of the site can be supported from a terrestrial ecological perspective.

Avifauna Specialist

While there are certainly some sensitive areas at the site that need to be avoided, there are also fairly of lower sensitivity plains present, where development should be focussed. As these plains are extensive, the extent of habitat loss resulting from the development of the PV facilities at the site is considered low and would not be likely to pose a threat to the long-term persistence of any avifauna at the site. With the implementation of these mitigation measures, the impact of the development can be reduced to an acceptable level and as such there are no fatal flaws associated with the development that should prevent it from proceeding.

Chiropteran Specialist

In my opinion, based on the data collected during the bat baseline survey and available literature, there is little reason from a chiropteran perspective for the development of the proposed Soventix Solar Farm not to be approved.

Heritage Specialist

From a cultural heritage point of view the development should be allowed to continue, once the recommended mitigation measures have been implemented.

Visual Specialist

Overall, considering all relevant criteria, **Alternative 2** is considered the **preferred alternative**, and is recommended from a visual perspective. However, both Alternatives 1 and 3 would be acceptable should Alternative 2 not be viable due to other constraints.

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Social Specialist

None of the social impacts identified are so severe that the project should not continue. Based on the findings of this report, it is recommended that the project continues, on the conditions that the mitigation measures are implemented.

Hydrological Specialist

The results of the analysis indicate that the water level in the watercourse is not expected to reach the pylon of concern, at its currently indicated location. The impact on water quality of the construction and operation of the powerline between the solar PV array and the existing Eskom 400 kV powerline is expected to be LOW prior to mitigation, reducing to VERY LOW with the implementation of the proposed mitigation measures. The impact on catchment yield (water quantity) is assessed as NO IMPACT.

Aquatic Specialist

The project team took great care to position the location and construction footprint in such a way that all the identified sensitive areas were avoided. This realignment of the original project footprint (preferred option Alternative 2) incorporated the 100m buffer zone and most suitable placement of the power line pylons.

Paleontology Specialist

There are no fatal flaws in the proposed alternative energy project from a palaeontological heritage viewpoint. Cumulative impacts of fossil heritage in the context of several proposed or authorised alternative energy developments in the region (especially around De Aar) are assessed as low, given their comparatively small footprint compared with the outcrop area of the rock units concerned. There are no objections to authorisation of the proposed solar development, provided that the recommended mitigation measures are incorporated into the EMPr for this project and fully implemented.

Traffic Specialist

Based on the conclusions, it is recommended that the proposed development of a 225MW solar PV facility be approved. Access to the plant from the N10 should comply with the relevant standards.

Recommended conditions within the Environmental Authorisation

1. The holder of the authorisation must appoint an experienced independent Environmental Control Officer (ECO) for the construction phase of the development that will have the responsibility to ensure that the mitigation/rehabilitation measures and recommendations referred to in this environmental authorisation are implemented and to ensure compliance with the provisions of the approved EMPr.
2. The authorisation is valid for 10 years and there should be no restriction on commencement of construction as the project is reliant on the REFIT program.
3. If the project is launched 5 years after the authorisation is granted there should be a review of the EA and EMPr against all legislation, technology and renewable energy best practice.
4. Vegetation clearing must be kept to an absolute minimum. Mitigation measures must be implemented to reduce the risk of erosion and the invasion of alien species.

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5. An integrated waste management approach must be implemented that is based on waste minimisation and must incorporate reduction, recycling, re-use and disposal where appropriate. Any solid waste, which will not be recycled, must be disposed of at a landfill licensed in terms of section 20 (b) of the National Environmental Management Waste Act, 2008 (Act No. 59 of 2008).
6. A permit must be obtained from the relevant nature conservation agency for the removal or destruction of indigenous, protected or endangered plant or animal species and a copy of such permit/s must be submitted to the Department for record keeping.

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SECTION R: OPERATIONAL ASPECTS AND POST CONSTRUCTION MONITORING.

(r) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded, and the post construction monitoring requirements finalised;

N/A.

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SECTION S: APPOINTED INDEPENDENT EAP

An undertaking under oath or affirmation by the EAP in relation to-

Report Information Accuracy.

(i) the correctness of the information provided in the report;

EAP AFFIRMATION.

Appendix 2 Section 3 (s) of the Environmental Impact Assessment (EIA) Regulations, 2014 (promulgated in terms of the National Environmental Management Act 107 of 1998, as amended - NEMA), require an undertaking under oath or affirmation by the Environmental Assessment Practitioner (EAP) in relation to;
(i) the correctness of the information provided in the reports;
(ii) the inclusion of comments and inputs from stakeholders and I&APs;
(iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and
(iv) any information provided by the EAP to interested and affected parties and any

I, **Justin Aragorn Bowers**, on behalf of Ecoleges, hereby affirm that all comments and inputs received from stakeholders, specialists, interested and affected parties have been accurately recorded herein and, insofar as comments and recommendations are relevant and practicable, accommodated in the final Environmental Impact Assessment Report submitted to the Competent Authority, thereby attaining a desirable level of agreement for undertaking the environmental impact assessment.

Signature of the EAP

12th December 2017
DATE:

Stakeholder and Interested and Affected Parties Feedback.

(ii) the inclusion of comments and inputs from stakeholders and interested and affected parties; and

Please refer to the Public Participation Process in **Appendix D.**

Specialist Report findings and recommendations.

(iii) The inclusion of inputs and recommendations from the specialist reports where relevant; and

Please refer to the Public Participation Process in **Appendix D.**

Comments and Response between EAP and Interested and Affected Parties.

(iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;

Please refer to the Public Participation Process in **Appendix D.**

SECTION T: FINANCIAL PROVISION[S] FOR REHABILITAION, CLOSURE AND DECOMMISSIONING.

(t) where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;

N/A

SECTION U: ANY DEVIATION FROM THE SCOPING REPORT.

(u) an indication of any deviation from the approved scoping report, including the plan of study, including-
(i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and
(ii) a motivation for the deviation;

N/A

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SECTION V: COMPETENT AUTHORITY SPECIFIC INFORMATION

(v) any specific information required by the competent authority; and

Specific Information:

The requirements have been addressed in the EIAr following the letter received from the Competent Authority DEA signed on 30th May 2017.

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
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SECTION W: OTHER INFORMATION REQUIRED BY REGULATIONS

(w) any other matter required in terms of section 24(4)(a) and (b) of the Act.

Other Information:

The EAP has updated the listed activities (Table 1) to include the amendments to the Environmental Impact Assessment Regulations, 2014 Government, Gazette No 40772 including GNR 325, GNR 326, GNR 327 and GNR 328 dated 7th April 2017.

(2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to an environmental impact assessment report the requirements as indicated in such notice will apply.

Noted.

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
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MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
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SECTION N: APPENDICES

APPENDIX A: SITE PLAN(S)

Annexure A: Goedehoop Status Quo Map
Annexure B Goedehoop Slope Analysis Map
Annexure C: Goedehoop Development Property Map
Annexure D: Goedehoop Regional Map
Annexure E: Goedehoop Sensitivity Map
Annexure F: Goedehoop Cumulative Impact Map
Annexure G: Goedehoop Final Site Development Map & Alternatives
Annexure H: Deeds copies of all affected properties & Land Claim Letter
Annexure I: Preferred Alternative Boundary Points

APPENDIX B: SITE PHOTOGRAPHS

Annexure A: Site photos

APPENDIX C: TECHNICAL REPORT

Annexure A: Grid Solutions Opinion Report
Annexure B: Technical Details

APPENDIX D: PUBLIC PARTICIPATION PROCESS

Annexure A: Level of public participation
Annexure B: Site notice text
Annexure C: Proof of displayed notice boards
Annexure D: Background Information Document (BID) text
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Annexure E (1): Distribution by email
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Annexure H: List of Registered Interested and Affected Parties
Annexure H (1): Attendance Register
Annexure H (2): Public Meeting Minutes
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Annexure N: Long term Agricultural Lease application process.

APPENDIX E: IMPACT ASSESSMENT

Annexure A: Impact Assessment
Annexure B: Impact Score Sheet

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
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APPENDIX F: SPECIALIST REPORTS

Annexure A: Visual Impact Assessment
Annexure B: Heritage Impact Assessment
Annexure C: Chiropteran Assessment (Bat Survey)
Annexure D: Grazing, soils and wetland Impact Assessment
Annexure E: Traffic Impact Assessment
Annexure F: Social Impact Assessment
Annexure G: Fauna and Flora Impact Assessment
Annexure H: Avifauna Assessment
Annexure I: Geotechnical Assessment
Annexure J: Hydrological Assessment
Annexure K: Aquatic Assessment
Annexure L: Paleontology Assessment

APPENDIX G: ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT (EMPR)

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
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APPENDIX A: SITE PLAN(S)

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
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Annexure A: Goedehoop Status Quo Map

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Annexure B: Goedehoop Slope Analysis Map

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure C: Goedehoop Development Property Map

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure D: Goedehoop Regional Map

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
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Annexure E: Goedehoop Sensitivity Map

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
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Annexure F: Goedehoop Cumulative Impact Map

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure G: Goedehoop Final Site Development Map & Alternatives

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure H: Deeds Copies of Affected Properties

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure I: Preferred Alternative Footprint Boundary Points

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
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APPENDIX B: SITE PHOTOGRAPHS

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
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Annexure A: Site photos

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

APPENDIX C: TECHNICAL REPORTS

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
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Annexure A: Grid Solutions Opinion Report

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
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Annexure B: Technical Details

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

APPENDIX D: PUBLIC PARTICIPATION PROCESS

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure A: Level of public participation

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
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Annexure B: Site notice text

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure C: Proof of displayed notice boards

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
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Annexure D: Background Information Document (BID) text

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure E: Proof of given Background Information Document (BID)

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure E (1): Distribution by Email

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure E (2): Distribution by Post

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
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Annexure F: Advertisement text

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure F (1): October 2016 Advertisement Text

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
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Annexure F (2): February 2017 Advertisement Text

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure G: Proof of placed advertisement

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure G (1): Northern Cape Express Newspaper Advert

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure G (2): Noordkaap Newspaper Advert

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure H: List of Registered Interested and Affected Parties

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure H (1): Attendance Register

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure H (2): Public Meeting Minutes

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure I: Comment and Response Sheet

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure J: Copies of Comments Received

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure K: Proof of Submission/delivery of the FSR to all State Departments/Organs of State

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure L: Request for Comments Trail Record

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure M: Clarity Regarding Project Description

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure N: Long term Agricultural Lease application process

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

APPENDIX E: IMPACT ASSESSMENT

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure A: Impact Assessment

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure B: Impact Score Sheet

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

APPENDIX F: SPECIALIST REPORTS

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure A: Visual Impact Assessment

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure B: Heritage Impact Assessment

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure C: Chiropteran (Bat) Assessment

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure D: Grazing, soils and wetland delineation assessment

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure E: Traffic Impact Assessment

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure F: Social Impact Assessment

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure G: Fauna and Flora Impact Assessment

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure H: Avifauna Assessment

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure I: Geotechnical Assessment

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure J: Hydrological Assessment

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure K: Aquatic Assessment

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

Annexure L: Paleontology Assessment

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

APPENDIX G: ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat., MGSSA) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23