

(v) The Impacts and Risks

DOCUMENT CONTROL

COMPILED/REVISED BY	STATUS	REVISION	REVIEWED/ APPROVED BY	DISTRIBUTED ON
Hlengile Mtsweni	Draft	00		1 October 2016
Hlengile Mtsweni	Draft	01	Justin Bowers	10 November 2016
Hlengile Mtsweni	Draft	02	Shaun MacGregor	25 November 2016
Hlengile Mtsweni	Draft	03	Justin Bowers	29 November 2016

“(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;”

The general objective of integrated environmental management is, *inter alia*, to “identify, predict and evaluate the potential and actual impact on the environment, socio-economic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities, with a view to minimising negative impacts, maximising benefits, and promoting compliance with the principles of environmental management” (Section 23(2) (b) of NEMA).

Ecoleges sets out to identify impacts and suggest mitigations by following the logical sequence of steps illustrated in **Figure 2**. The first step has already been completed in **SECTION D** of this document. A clearly defined scope is absolutely critical for creating the mold within which the EMPr shall be cast. 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 interact with the environment. Consequently, the activities need to be identified (step 2) before their impacts (step 3) can be predicted. Step 4 is incorporated as a safety net to capture those elements that are not identified in the previous two steps. Finally, mitigations are sought and tailored to counteract the project-specific impacts and achieve particular goals and objectives in line with environmental best practices.

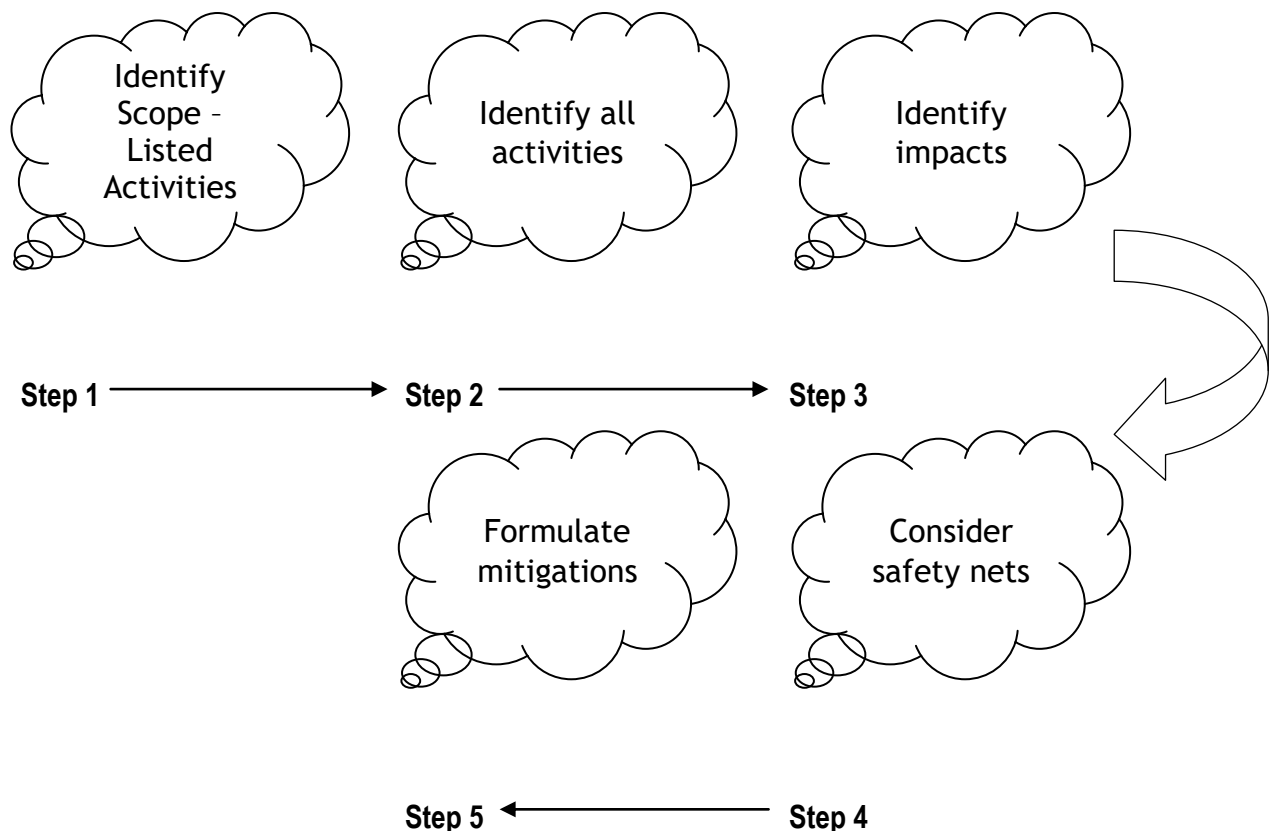


Figure 2: Procedure for identifying the project-specific mitigation of activities.

Identification of Activities

Table 4 (in **SECTION D**) includes the Listed Activities identified in terms of GN No. R. 983 and a description of the associated actual activities to be undertaken by the applicant: the first column in **Table 4** identifies the activity number and Listing Notice; the second column illustrates the listed activities; and the third column describes the actual activities proposed by the applicant, and which triggered the aforementioned listed activities. **Table 5** describes all of the activities that will be undertaken during the lifespan of this project including the identified listed activities (**Table 4**) and associated activities that in their own right do not require environmental authorization, but are needed to achieve the desired objective, that is the supply of renewable energy via:

a 225MW solar photo-voltaic (PV) farm, in the form of 3 interconnected 75MW plants, connected to a sub-station that ties into the existing ESKOM 400KV overhead power lines.

Table 5: Typical activities for the construction, operation & decommissioning of a Solar PV Plant.

Phased Activities Associated with Solar PV Projects	
PV panels, associated panel mounting hardware, cabling, and an inverter. Associated infrastructure includes access roads, office (including taps for drinking water, flush toilets and basins for washing hands), lighting and fencing.	
Planning and Design	
Compliance with legal requirements by acquiring authorisations, permits and/or licenses for activities/uses undertaken during construction and operation.	YES
Sustainable resource requirements (water, energy, etc.) for lifespan of project.	YES
Rezoning (Land use) - A commercial development where such land was used for agriculture and where such development will occur outside an urban area, where the total land to be developed is bigger than 1 hectare. <i>The current agricultural land-use will be partially retained for livestock grazing, but significant areas will be converted for a commercial Solar PV Plant over a fixed-term.</i>	YES
Layout and design including consideration of alternatives	YES
Pre-construction	
Surveying and Pegging (all footprints from permanent to temporary access roads).	YES
Construction	
Lighting	YES
Access control including fencing of perimeter.	YES
Human influence (staff conduct, movement).	YES
Construction of permanent and temporary access roads. - The clearance of an area of 1 hectare or more of indigenous vegetation. <i>Vehicle service tracks will be created between the panel arrays and around the perimeter of the facility on the inside of the fence.</i>	YES
Transport on site and accommodation of traffic.	YES
Sourcing & management of water (for drinking, sanitation & construction activities).	YES
Sourcing building sand.	YES
Stockpiling and laydown areas (spoil, mulch, building sand, topsoil, windrows, material & equipment)	YES
Clearing and grading (fence line, operations area, access roads, rack foundations, transformers and inverters, cables, substation and pylons)	YES
Earthworks & excavations (associated with the operations area, road crossings, cabling, transformers and inverters, substation and pylons) - Infilling or depositing of any material of more than 5m³ into... or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5m³ from – (i) a watercourse.	YES

- Altering the bed, bank, course or characteristic of a watercourse. - Impeding or diverting the flow of water in a watercourse. <i>The Solar PV plant will feed into existing overhead ESKOM transmission lines that are located within an expansive drainage system.</i>	
Blasting	NO
Drilling (the rack foundations for the panel mounting hardware and fence poles)	YES
Feeding or tying the solar PV plant into existing Eskom grid	YES
Waste management (solid & liquid waste including 'spoil'/handling, separation, storage and disposal)	YES
Hazardous substance (fuel/oil, cement, bitumen, sewage/grey water) management (handling and storage) at sanitation sites, kitchens, batching sites, workshops, washbays, refuelling areas and on site.	YES
Construction site closure and rehabilitation.	YES
Operation (including maintenance)	
Human influence	YES
Consumption (energy, water, and other resources).	YES
Maintenance	YES
Lighting to create visibility at night.	YES
Waste management	YES
Terrestrial and aquatic ecological management.	YES
PV panels, which convert the sun's radiation to electrical energy. - The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more. <i>The solar PV installation will be a minimum of 75MW with additional phases in increments of 75MW possible.</i>	YES
An inverter, which is a key component in matching panels' output to the grid and converts the panels' direct current (DC) electrical output to alternating current (AC). - The development of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial complex. <i>The overhead ESKOM lines are 400KVA and the tie-in from the sub-station to the ESKOM overhead lines will thus need to be 400KVA.</i>	YES
Substation	YES
Decommissioning	
Disposal of PV panels and other waste.	YES
Human influence (staff conduct, movement)	YES
Rehabilitation of affected footprints.	YES

Identification of Actual and Potential Impacts

The impacts are considered within the scope implicit within the listed activities (**Table 4**). The relevant impacts resulting from the listed, actual and associated activities, including environmental, socio-economic and cultural heritage, were determined using a Leipold Matrix (**Table 6**), comments received from Interested and Affected Parties (**Table 7**), and, where applicable, the findings contained in specialist studies (**Figure 2**).

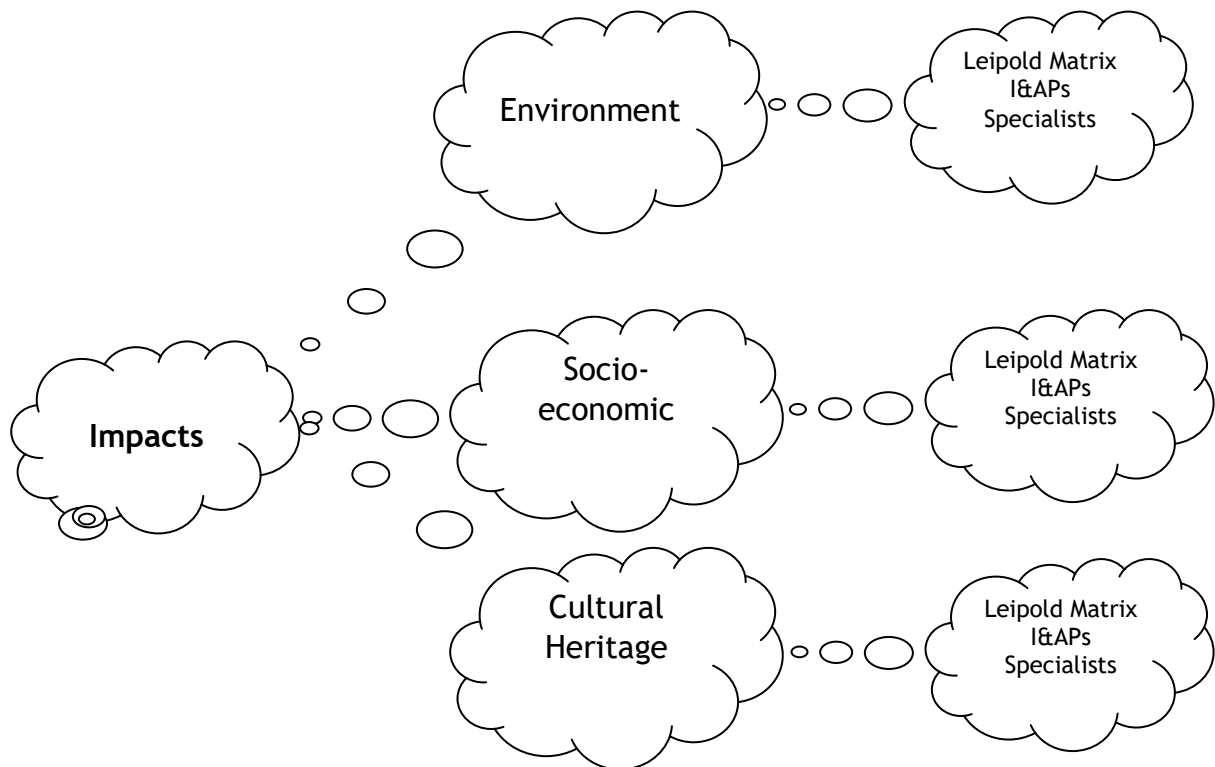


Figure 2: A breakdown of the different types of impacts including the resources used to identify them.

Table 6: Leipold Matrix used to identify environmental impacts - any change to the natural, socio-economic and cultural environment resulting from the development's activities during planning, construction, operation and decommissioning.

See Appendix E, Annexure B

Table 7: Identification of Potential Impacts from registered Interested and Affected Parties (I&APs).

I&AP	Source	Comment - Impacts
<p>Jacoline Mans Designation: Chief Forester Tel: 054 338 5909 Fax: 054 334 0030 E-mail: JacolineMa@daff.gov.za</p>	<p>Email on 04/10/2016</p>	<ol style="list-style-type: none"> 1. Potential impacts on NFA listed protected trees (if any). 2. Impact on Riparian vegetation. 3. Obtain Flora and Fauna Permits where necessary.
<p>Francois Taljaard – Town Planner Emthanjeni Municipality Cel: 083 959 1157 Fax: 053 6311518 Email: taljaardf@emthanjeni.co.za</p>	<p>Email on 14/10/2016</p>	<ol style="list-style-type: none"> 1. Impact of the shortage of water 2. Rezoning of each site where development is to take place. 3. Approval of building plans before construction work can commence. 4. The disposal or processing of packaging material must be addressed in the EIA. Packaging material is currently being used in the townships for additions to houses, which is illegal and creates a fire hazard.
<p>Bonnie Schumann Senior Field Officer</p> <p>Endangered Wildlife Trust Drylands Conservation Programme</p> <p>W: 053 813068 C: 072 122 4232 Email: bonnies@ewt.org.za</p>	<p>Email on 26/10/2016</p>	<ol style="list-style-type: none"> 1. These are potential areas for Critically Endangered Riverine Rabbits - Riverine Rabbit impacts.

The potential impacts identified by I&APs (**Table 7**), were designated to the applicable phases of implementation (**Table 8**) for appropriate consideration and mitigation during the impact assessment phase.

Table 8: Potential impacts identified by I&APs and phases of implementation.

Comments	Description of Impact & Phase of Implementation			
	Planning	Construction	Operation	Decomm.
Potential impacts on NFA listed protected trees (if any).	Yes	Yes	Yes	No
Impact on Riparian vegetation.	Yes	Yes	Yes	No
Obtain Flora and Fauna Permits where necessary.	Yes	No	No	No
Impact of the shortage of water	Yes	Yes	Yes	No
Rezoning of each site where development is to take place.	Yes	No	No	Yes
Approval of building plans before construction work can commence.	Yes	No	No	No
The disposal or processing of packaging material must be addressed in the EIA. Packaging material is currently being used in the townships for additions to houses, which is illegal and creates a fire hazard.	No	Yes	No	No
These are potential areas for Critically Endangered Riverine Rabbits - Riverine Rabbit impacts.	Yes	Yes	No	No

Methodology for Assessing Environmental Impacts

Natural environmental, socio-economic, and cultural impacts shall be assessed using the approach outlined below.

Natural environmental, socio-economic, and cultural impacts were identified systematically by considering how the site-specific activities for each phase of development will interact with all elements of the receiving environment (**Leipold Matrix; Table 6**). All impacts, including those identified by I&APs and Specialists, will be measured against the current land-use activity (the no-go option/option of not implementing the activity) and systematically assessed by rating a suite of generic criteria (**Table 9**) established by the Department of Environmental Affairs and Tourism (DEAT 2002). The criteria are:

- Extent or spatial scale,
- Intensity or severity of the impact,
- Duration of the impact,
- Mitigatory potential,
- Social acceptability,
- Degree of certainty,
- Status of the impact, and
- Legal requirements.

The magnitude and significance of impacts were determined by describing the impacts in terms of the above criteria. The criteria provide a consistent and systematic basis for the comparison and application of judgements.

The suite of criteria was sought for its applicability to EIA, specifically by making provision for the variety of perspectives. Significance is an anthropocentric concept that makes use of value judgements and science-based criteria. Judgement and values are used to greater extent in EIA than science-based criteria and standards (DEAT 2002). Considering value judgements can vary greatly amongst different stakeholders, professional judgement, such as that of the EAP, should ideally be used in conjunction with the different value judgements expressed by various stakeholders. In other words, significance should be communicated from a variety of perspectives other than the professional opinion of a multidisciplinary study team, and include environmental, socio-economic or cultural attributes perceived by society to be significant. Despite the potential variety of perspectives, they can be categorized into three broad forms of recognition or determination of impact significance, namely institutional (laws, plans or policy statements), public and technical (scientific or technical knowledge or judgement of critical resource characteristics) recognition (DEAT 2002). Consequently, the magnitude and significance of impacts were as far as possible determined by reference to legal requirements, accepted scientific standards and/or social acceptability.

Significance is relative and must always be set in a context to show whose values they represent. The selected criterion provides such a context, taking all three forms of recognition into account by asking whether impacts are legally, publically and professionally recognized as important. The thresholds, against which significance of a given environmental effect was measured or determined, were provided by a set of ratings for each criterion (**Table 9**). Thresholds of significance were as far as possible based on/determined by reference to legal requirements, accepted scientific standards or social acceptability. Ratings are High (H-4), Moderate (M-3), Low (L-2) or No Impact (N-1) and determined according to clearly defined descriptors. The 'No Impact' rating includes reference to 'no impacts beyond prescribed thresholds'. In other words, mitigations that change the ratings of any particular criteria to 'N' do not necessarily infer zero impact, but rather that the impact is restricted to prescribed thresholds as defined in the goal and objective(s) of the proposed mitigation(s). The significance of the impacts of the proposed project was assessed both with and without mitigation action.

Table 9: Impact Evaluation Criteria, Ratings and Descriptors.

Criteria	Ratings and Descriptors			
	High (4)	Moderate (3)	Low (2)	No Impact (1)
Spatial Scale/ Extent	Provincial, National, or International. Far beyond the site boundaries. Widespread	Local (within the farm boundary) to Regional (beyond the farm boundary, impact affects neighbors).	Development footprint to within the site boundary.	No area is affected.
Intensity/ Magnitude	Functioning of processes will cease. Complete change in species occurrence and variety. Disturbance of pristine areas/plants of conservation concern that have important conservation value. Magnitude of impact exceeds legal limits, scientific standards or social acceptability.	Modified processes will continue. Moderate change in species occurrence and variety. Disturbance of potential conservation areas or are of use as a resource.	Natural processes are affected, but not modified. Minor change in species occurrence and variety. Disturbance of degraded areas.	Natural processes are not affected.
Duration	Permanent Beyond decommissioning. Long term (>2yr)	Temporary Lifespan of the operational phase. Medium term (>1<2yr)	Immediate, once-off. Lifespan of the construction phase. Short term (<1yr) Restricted to a season.	
Mitigatory Potential	High potential to	There is a	There is a	No mechanism

	mitigate and achieve objectives.	moderate potential to mitigate, and achieve objectives.	potential to mitigate, but there remains a risk of the objectives not being met.	for mitigation and achieving the objectives.
Acceptability	Unacceptable Abandon project or design.	Manageable with expensive regulatory controls and the project proponent's commitments	Some risk to public health/ environment, but it is easily averted using simple controls/ mitigations	Acceptable No risk to public health/ environment.
	Definite (D- 4)	Probable (P - 3)	Improbable (I- 2)	No Impact (N-1)
Degree of Certainty/Probability of the impact occurring	Substantial supportive data. Impact will occur regardless of preventive measures. High probability. >95%	There is a chance/risk of the impact occurring. Moderate probability. 5-95%	It is unlikely that the impact will occur. Low probability. <5%	The impact will not occur. 0%
	Negative	Neutral	Positive	
Status	Net loss of resource. Adverse	No net loss or gain.	Net gain of resource. Beneficial	

Assessment of Impacts

The identified actual and potential Impacts, including the Leipold Matrix (**Table 6**), comments received from I&APs (**Table 7**) and findings contained in specialist assessments, are segregated amongst the different phases of implementation (planning and design, construction, operation and decommissioning) so that they can be logically managed/mitigated for by the responsible role players at the appropriate time. Apart from the aforementioned impacts, a number of mandatory impacts (for consideration during the planning and design phase) are included for evaluation in all environmental impact assessments, including, *inter alia*, Potential Offences and Consumption of Resources. Furthermore, 'Degradation' is defined and treated as an impact during construction (construction site closure) and decommissioning.

Planning and Design Phase

Impact 1: Potential Offences

Description

- **Protected Species.** Comments received from **Jacoline Mans**, Chief Forester, DAFF (**Table 8**); investigate potential impacts on NFA listed protected trees & obtain flora and fauna permits where necessary - clearing operations in the PV Solar Plant servitudes will disturb or destroy natural flora and fauna, including protected species. Licenses/permits are required prior to impacting protected species in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)¹, the National Forests Act, 1998 (Act No. 84 of 1998)² and any applicable provincial legislation.
- **Water use.** Excavation for the purposes of constructing a substation, erecting pylons/poles and access roads inside an extensive drainage system will require section 21 (c) & (i) water use entitlements⁵.
- **Water use.** Comments received from **Francois Taljaard**, Town Planner, Emthanjeni Municipality (**Table 8**); investigate potential impacts on the shortage of water - water may be abstracted illegally for use during construction and operation. In terms of section 25(1) of the NWA, 1998⁴ the person authorized to use water for irrigation may request a water management institution to use some of that water for a different purpose, such as construction. In terms of section 25(2) of the NWA, 1998⁴ a person holding an entitlement to use water may surrender that entitlement or part thereof to facilitate a license application for the use of water from the same resource in respect of other land. A landowner may take water without a water use license but it is subject to the provisions and limitations prescribed in General Authorisation No. 399 published in Government Gazette No. 26187 on 26th March 2004⁵. Alternatively a section 21(a) water use license will be required to abstract during construction and operation.
- **Borrow Pits.** Material will be required to cover excavations (where applicable). Borrow pit licensing is classified as small-scale mining under the Mineral and Petroleum Resources Development Act, 1991 (Act 50 of 1991) and is administered by the Department of Minerals

and Energy, through whom any permit applications must be lodged. Exemptions are applicable where the borrowing of material is for the improvement of that same land³.

- **Access Roads.** The construction of any access roads will need to be authorised in terms of the NEMA listed activities, 2014 if they exceed certain thresholds⁶.
- **Servitudes and Wayleaves.** The construction of the PV Solar Plant will intersect Eskom's servitude/power lines (Distribution and/or Transmission). Construction without permission will constitute an offence in terms of the relevant legislation, such as the Electricity Act, 1987 (Act 41 of 1987), as amended in 1994⁷.
- **Compliance Monitoring.** Construction may commence prior to the appointment of an Environmental Control Officer (ECO), which is a condition of this EMPr.
- **Municipal By-law.** Comments received from **Francois Taljaard**, Town Planner, Emthanjeni Municipality (**Table 8**); approval of building plans before construction work can commence - Emthanjeni Local Municipality shall not issue a certificate referred to in section 118(1) of the Local Government: Municipal Systems Act, 2000 (Act No. 32 of 2000), regarding land, unless, *inter alia*, the Municipality is satisfied that any building erected on the land, in respect of which plans and specifications are to be drawn and submitted to the Municipality for approval in terms of the Act, is properly erected and maintained in accordance with such plans and specifications⁸.

Uncertainties & limitations with predicting this impact

- None

Assumptions made when assessing the impact

- Cover material will not be mined or imported. In-situ material will be used. Consequently, a sand mining permit is not required.
- The contractor will obtain water from a commercial source if water is required during construction.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	4	4	4	3	36
With	0	0	0	0	0

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	4	Negative	H
With	1	Neutral	

Reference (legal, scientific, social or other criteria)

1. National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).
2. The National Forests Act, 1998 (Act No. 84 of 1998), including Schedule in Government Notice No. 1042, dated 10 September 2004.
3. Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002); Exemptions Section 106, sub-section 3.
4. National Water Act, 1998 (Act No. 38 of 1998).
5. Section 21(a) - General Authorisation No. 399 published in Government Gazette No. 26187 on 26th March 2004; Section 21(c) and (i) - General Authorisation No. 509 published in Government Gazette No. 40229 on 26th August 2016.
6. GN No. R. 985, 04th December, 2014 (LN3).
7. Electricity Act, 1987 (Act 41 of 1987), as amended in 1994.
8. Building Control By-Law, 2008 (By-law No. 4 2008) – “To provide for the control of buildings erected on land in the Emthanjeni municipality; and for matters concerned therewith.”

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- Section 24G of NEMA allows for the rectification of unlawful commencement or continuation of a listed activity.
- Non-compliance with other legislation may result in criminal prosecution or other actions provided for in the relevant legislation.

Mitigations

Goal: Achieve compliance.

Objective(s) (including targets):

- Comply with all relevant legislation.

Impact 1: Potential Offences		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Applicant ECO	The applicant shall apply for and obtain the relevant licenses/permits from the appropriate authorities (DAFF, DEA, and Provincial Authority) prior to disturbing or destroying any protected species.
Avoidance	Applicant	Water required during construction and operation for human consumption (drinking, sanitation and food preparation), building activities (mixing cement, watering gravel roads), livestock and maintenance (cleaning solar panels) shall be pre-authorized via a General Authorisation, purchase or temporary transfer of irrigation water from a land owner or Water Use License.
Avoidance	Applicant	The applicant shall apply for a water use entitlement, i.e. a General Authorization or Water Use License for section 21(c) and (i) water uses, prior to constructing a substation, access roads and erecting

		pylons/poles inside a watercourse.
Avoidance	Contractor	If building sand is required, the contractor shall be permitted to borrow material from the on-site quarries without the need to apply for a permit or license in alignment with section 106 under the MPRDA, dealing with exemptions.
Avoidance	Applicant Engineer Contractor	Access roads may not be wider than 4 metres with a reserve less than 13.5 metres.
Avoidance	Applicant	The applicant shall apply for a wayleave(s) from Eskom prior to commencing with construction within their servitude, if applicable.
Avoidance	Applicant	An experienced and independent ECO shall be appointed prior to the commencement of construction to oversee construction, including the identification and permitting/licensing of protected species prior to clearing.
Avoidance	Applicant	The plans and specifications for any building, whether of a temporary or permanent nature, to be erected on the land must be submitted to the Emthanjeni Local Municipality for approval in terms of the Local Government: Municipal Systems Act, 2000 (Act No. 32 of 2000).

Impact 2: Sustainable resource requirements (water, energy, etc.) for lifespan of project

Description

- A readily available, legal source of water will be required for use during construction and operation of the solar PV plant.
- Human resources (workers) will be required during construction and operation.
- **Water use.** Comments received from **Francois Taljaard**, Town Planner, Emthanjeni Municipality (**Table 8**) states that the municipality will not be able to supply water to the project as the area's groundwater is already constrained.

Uncertainties & limitations with predicting this impact

- It is assumed that the boreholes on site will provide sufficient water for both construction & operation. The water requirements fall within the permissible thresholds stipulated in the relevant General Authorisations under the National Water Act.
- The electricity is currently being supplied to the landowner by Eskom and additional connections would be available to the developer.

Assumptions made when assessing the impact

- Water will be required to clean the solar PV panels.
- Water required for livestock does not require licensing under Schedule 1 of the National Water Act.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	3	2	4	3	27
With	2	2	2	1	6

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	2	Neutral	H
With	1	Positive	

Reference (legal, scientific, social or other criteria)

- None

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- The impact can be reversed by making use of alternatives for energy and water. At the termination of the project, the resources will no longer be required.

Mitigations

Goal: Avoid overburdening the current natural resources.

Objective(s) (including targets):

- Not to overburden the current systems or sustainable resources.

Impact 2: Sustainable resource requirements (water, energy, etc.) for lifespan of project		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Applicant	Ensure adequate on-site water can be provided as the Municipality will not be able to supply.
Reduction	Applicant	Have back-up systems (generator, JoJo tanks, etc.) to use, in order to alternate/reduce demand on existing systems and accommodate power outages etc. Enforce water and energy saving measures where possible.
Rectification	Applicant	Multiple sources of water should be investigated e.g. surface and ground water so they can be used interchangeably when needed.

Impact 3: Rezoning

Description

- Comments received from **Francois Taljaard**, Town Planner, Emthanjeni Municipality (**Table 8**); investigate rezoning of each site where development is to take place¹⁻³.
- Solar facilities may interfere with existing land uses. Unlike wind facilities, there is less opportunity for solar projects to share land with agricultural uses. However, the developer has agreed to implement the proposed project in synergy with the current landuse practices and not at the expense of them.
- Loss of habitat for agricultural use, if solar developments become exclusion zones for livestock and game.

Uncertainties & limitations with predicting this impact

- A rezoning application (to 'Special' or other appropriate zoning) will only be prepared and submitted to the provincial administration and the local municipality if the proposed project attains preferred bidder status.

Assumptions made when assessing the impact

- The proposed site and alternative sites are currently zoned as Agriculture and has historically been used as grazing for small game and livestock. It is further assumed that grazing of livestock within the developed footprint as a vegetation management tool can be implemented effectively.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	3	4	4	3	33
With	2	2	3	2	14

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	2	Neutral	M
With	1	Positive	

Reference (legal, scientific, social or other criteria)

1. Northern Cape Planning and Development Act, 1998.
2. Emthanjeni Local Municipality, Integrated Development Plan (IDP), 2016/2021
3. Emthanjeni Municipality, Spatial Planning & Land Use, Management By-law, Northern Cape Province, GN No. 192 of 2015, Provincial Gazettes (Northern Cape), No. 1979 of 14th

December, 2015. Spatial Planning & Land Use Mgt Act No. 16 of 2013 (came into force on 01st July 2015).

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- Impact reversibility is determined by nature and extent of the impact on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage.
- Using Agricultural Land for a project of this nature puts a strain on the terrestrial quality of the land.
- The fact that limited hard structures will be used, there is a high probability that the area will recover well following decommissioning of the plant.

Mitigations

Goal: Avoid commercial use of land in the absence of appropriate zoning.

Objective(s) (including targets):

- To have the land zoned for the multiple land use practices.

Impact 3: Rezoning		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Applicant	A rezoning application (to 'Special' or other appropriate zoning) will be submitted to the provincial administration and the local municipality if the proposed project attains preferred bidder status.
Reduction	Applicant	To avoid penalties and/or fines the applicant must not commence with construction until the rezoning application has received a successful and/or positive status.
Rectification	Applicant	Construction will not commence unless approval/success in application has been granted.

Impact 4: Layout and design including consideration of alternatives

Description

- Comments received from **Jacoline Mans**, Chief Forester, DAFF (**Table 8**); investigate impact on riparian vegetation - permanent footprints can destroy sensitive habitats, including Riparian vegetation.
- Comments received from **Bonnie Schumann**, Senior Field Officer, Endangered Wildlife Trust (**Table 8**); these are potential areas for Critically Endangered Riverine Rabbits, investigate Riverine Rabbit impacts - permanent footprints can destroy sensitive habitats, including Riverine Rabbit habitat.
- Permanent footprints can disturb immovable flora, i.e. fence line, operations area, access roads, rack foundations, transformers and inverters, cables, substation and pylons.
- Placement of high risk (pollution generating) activities within close proximity to a watercourse can cause water pollution.
- Poor alignment of linear activities like roads, fences, pipelines or other cleared servitudes can increase runoff, cause erosion and sedimentation of aquatic habitats.
- Layout, alignments and design of permanent structures and roads can influence or redistribute surface water flow patterns.
- Layout and designs can be disruptive to local migration by causing fragmentation.
- Placement can be visually intrusive to sensitive receptors.
- Permanent footprints can disturb sites of historical significance, including graves.

Uncertainties & limitations with predicting this impact

- Detailed information on sensitive receptors is yet to be supplied by the Specialists, which may have a substantive bearing on the preferred layout option.

Assumptions made when assessing the impact

- The three alternatives are similar in environmental sensitivity.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	3	3	4	3	30
With	2	2	2	2	12

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	2	Negative	H
With	1	Positive	

Reference (legal, scientific, social or other criteria)

1. None.

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- Impact reversibility is determined by nature and extent of the impact on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage.

Mitigations

Goal: Avoid layouts & designs that will have negative impacts on the environment and affected landowners.

Objective(s) (including targets):

- To have preference given to those layouts and designs with the least negative impacts to the environment and that pose the most practicable option financially and technically.

Impact 4: Layout and design including consideration of alternatives		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Engineer Applicant	Have more than one layout and design, and assess each alternative objectively.
Reduction	Contractor Applicant	Ensure that the preferred environmentally friendly layout and design is inclusive of all environmental aspects and impacts and employs the necessary mitigations.
Rectification	Contractor Applicant	Ensure that following new information that may impact the development footprint, these changes are adopted where the change results in a nett environmental benefit.

Impact 5: Socio-economic

Description

Comments from the Social Impact Assessment Report by Dr Ilse Aucamp of Equispectives Research and Consulting Services - Expectations regarding creation of opportunities (Jobs etc.).

Uncertainties & limitations with predicting this impact

- The information gathered from the various planning documents for the area (IDP, SDF, etc.) as well as the social specialist are accurate and represent the socio-economic state and requirements of the area.

Assumptions made when assessing the impact

- During the Public Participation Process, interest from I&APs will assist in establishing the job creation needs of the community.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	3	2	3	3	24
With	2	1	2	2	10

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	2	Neutral	M
With	1	Positive	

Reference (legal, scientific, social or other criteria)

- Social Impact Assessment Scoping Report.

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- Impact reversibility is determined by nature and extent of the impact on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage.

Mitigations

Goal: Avoid creating unreasonable employment expectations during the planning phase.

Objective(s) (including targets):

- To not create unrealistic expectations in respect of job creations.

Impact 5: Socio-economic		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Applicant Contractor	Be thorough and clear as to how many people will be employed temporary, permanently, etc.
Reduction	Applicant Contractor	Not raise the hope of the community.
Rectification	Applicant Contractor	Hire people and/or residents from and within the Emthanjeni Local Municipality, where possible.

Construction Phase

Impact 1: Pollution of air (quality) directly through the generation of light, dust, noise and emissions

Description

- Lighting in the construction camp can cause light pollution in remote areas.
- Noise from Contractor's employees (when communicating verbally and/or when playing radios/watching TV, etc.) can be a nuisance.
- Improper sanitation at latrine sites can cause an odor.
- Excessive emissions of Greenhouse Gases from vehicles can contribute toward climate change/global warming.
- Driving on dirt roads at speed in dry, windy conditions can generate dust.
- Construction plant can generate noise.
- Dust may be generated when transporting, handling and stockpiling material/cement in windy conditions.
- Handling stockpiles in dry, windy conditions can generate dust.
- Exposed areas are susceptible to wind erosion and the generation of dust.
- Drilling machines can be noisy.
- Drilling through soil can generate dust under windy conditions.
- Burning waste can create black smoke.
- Mixing cement powder in windy conditions can generate dust.
- Chemical toilets and other organic waste can produce an unpleasant odor.

Uncertainties & limitations with predicting this impact

- The magnitude of the impact, specifically the effects on ambient air quality, was not known.

Assumptions made when assessing the impact

- The distance to the nearest noise sensitive receptors, such as local communities or homesteads is too great to have an impact.
- Noise will not become a nuisance or disturbance¹ because it is unlikely that noise generated from the construction activities/camp will be loud enough to affect adjacent residents or road users.
- Dust generation will be restricted to delivering, handling and stockpiling of material.
- There will be no blasting.
- None of the activities require an atmospheric emissions license^{2 and 3}.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	3	2	2	3	21
With	2	1	2	2	10

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	2	Negative	H
With	1	Neutral	

Reference (legal, scientific, social or other criteria)

1. 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 section 25 of the Environment Conservation Act is not repealed by NEMA (107 of 1998).
2. National Environmental Management: Air Quality Act, 2004 (Act No. 39 Of 2004).
3. List of activities which result in atmospheric emissions. Government Notice No. 248 in Government Gazette No. 33064 of 31 March 2010.

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- Impact reversibility is determined by nature and extent of the impact on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage.
- Air pollution contributes to a global concern called the greenhouse effect.

Mitigations

Goal: Control air pollution

Objective(s) (including targets):

- To reduce noise levels to within locally, socially acceptable limits and standards so that it does not become a nuisance.
- To reduce light, dust and fuel emissions to within locally, socially acceptable and regulated limits.
- To reduce foul-smelling odours from the chemical toilets or waste.
- To prevent the generation of smoke from activities other than cooking.
- To prevent dust entrainment from vehicles and dispersment from delivered material.
- To reduce windblown dust from handling material and/or cement.

Impact 1: Pollution of air directly through the generation of light, dust, noise and emissions		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor	Unnecessarily loud noise is prohibited.
Reduction	Contractor	Construction plant and equipment shall be kept in good working order and maintained regularly to minimize unnecessary operating noise.
Avoidance	Contractor	Construction shall be limited to daylight hours.
Reduction	Contractor	Chemical toilets shall be kept hygienic and cleaned daily.
Reduction	Contractor	Chemical toilets shall be emptied when the drums are half full.
Avoidance	Contractor	All waste bins shall have lids.
Avoidance	Contractor	Do not litter, burn or bury waste on any property.
Avoidance	Contractor	Open fires are prohibited.
Avoidance	Contractor	Trucks transporting material shall be covered.
Reduction	Contractor	Do not handle material and cement during excessively windy conditions.

Impact 2: Pollution (quality) of soil and surface water directly through contamination by construction activities and sedimentation

The environmental impacts; soil and water pollution, have been assessed together because the same types of activities that can pollute the ground, can also impact a watercourse (if any) and the potential for storm water run-off to carry pollutants into the watercourse.

Description

- Cleared or dirt parking areas are susceptible to oil and fuel spills from leaking vehicles, causing soil pollution.
- Driving can compact soil stockpiles.
- Earthworks & excavations (associated with the operations area, road crossings, cabling, transformers and inverters, substation and pylons) can mix different soil types and horizons.
- Drilling (associated with the rack foundations for the panel mounting hardware and fence poles) can mix different soil types and horizons.
- Construction activities will produce solid and liquid waste, which can contaminate the ground (litter, spillage) if improperly handled, stored or disposed.
- Drip trays and bunds using sand as an absorbent will contaminate the sand and generate more hazardous waste.
- Spills can be covered with virgin soil.
- Improper handling (when refueling, repairing vehicles, mixing cement/slurry or bitumen) and storage of hazardous substances (fuel tanks, cement bags, oil & bitumen drums) can cause spillage.
- Cement can be mixed with topsoil to make concrete.
- Placement of high risk (pollution generating) construction activities within close proximity to a watercourse can cause pollution.
- Cleared and compacted areas without grass tussocks to impede surface water run-off, can increase surface water runoff, cause erosion and sedimentation, if adjacent to or within the watercourse, i.e. sand mining areas and linear activities like roads, fences, pipelines or other cleared servitudes.
- Fences aligned perpendicular to the contour can increase surface water runoff, cause erosion and sedimentation of a watercourse.
- The linear alignment of all roads can redistribute surface water flow patterns.
- Dirt roads can increase surface water runoff, cause erosion and sedimentation of a watercourse.
- Hard-surfaced roads and parking areas with storm water outlets can channel litter, oil and fuel spills into a watercourse, causing water pollution.
- Rainfall can wash soil stockpiles and windrows into a watercourse and cause sedimentation.
- Stockpiles and windrows can impede and/or redistribute surface water flow patterns.
- Excavations and trenches can trap and channel rainwater, erode and, if adjacent to or within a watercourse, cause sedimentation.

- Drill holes can fill up with rainwater or groundwater.
- Improper handling, storage or disposal of waste can cause toxicity – the introduction of toxic or hazardous substances into a watercourse, i.e. spills can be washed into the watercourse by storm water run-off and acidification, the increased acidity of waterways, can happen through the leeching of acid forming substances.
- Improper handling (mixing cement/slurry or bitumen) and storage of hazardous substances (fuel tanks, cement bags, oil & bitumen drums) can cause toxicity – the introduction of toxic or hazardous substances into a watercourse.
- Pumping, seepage or discharge of dirty water from the works area, grey water from washing equipment, plant, or persons, and of sewerage into a watercourse.
- Prolonged exposure of disturbed areas, including trenches, within a watercourse will increase the risk of seasonal flows, causing erosion and sedimentation.
- Contamination from spills when refuelling, parking, driving, repairing, washing and operating plant or equipment nearby or within the watercourse.
- Contamination of the watercourse from improper sanitation (bathing).

Uncertainties & limitations with predicting this impact

- The magnitude of the impact, specifically the extent and severity of the soil and water pollution, was not known.
- The volumes and types of different waste produced by individuals, construction and plant were unknown.

Assumptions made when assessing the impact

- A wire mesh security fence or clear view fencing will not alter existing surface water (rainfall runoff) flow patterns.
- The mitigation(s) proposed for addressing erosion will concurrently control sedimentation.
- Fuel tanks including their bunds will not be constructed within 32m from the edge of the watercourse/wetland (if any). They will be constructed within the main construction camp.
- Fuel drums, if any, will be stored and handled at the main construction camp.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	2	2	2	3	18
With	2	1	2	2	10

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	2	Negative	H
With	1	Neutral	

Reference (legal, scientific, social or other criteria)

1. The National Water Act (Act 36 Of 1998) is administered by the DWS.
2. Furthermore, the impact is assessed against the natural conditions that occurred before the immigration of man or machine. In other words, the contractor has to minimize his impact to reduce the construction footprint as far as possible. The condition of the site(s) was determined during the inspection(s).

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- Soil is a valuable and a finite resource given the geological scale required for its creation through the weathering of parent material/rock. The adoption of a site-specific and integrated waste management strategy can avoid the impact entirely through *inter alia* hydrocarbon spills, apart from unforeseen accidents. In the latter case impact is reversible if prompt action is taken to confine the waste, dispose of it appropriately and rehabilitate the affected site.
- The reversibility of surface water pollution is dependent on the nature and extent of the pollution.

Mitigations

Goal: Control soil and surface water pollution.

Objective(s) (including targets):

- To prevent all manner of waste from entering the pristine environment.
- To reduce soil and water contamination, including *inter alia* sedimentation, associated with construction activities.

Impact 2: Pollution of soil (quality) and surface water (quality) directly through contamination by construction activities, sedimentation or fishing		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor	The Contractor shall locate the construction camp on existing disturbed or the least sensitive sites above the 1:100 year flood line or further than 32m from the edge of a watercourse, whichever is greatest.
Avoidance	Contractor	The contractor shall restrict the following activities to the construction camp: Accommodation, Sanitation, Waste storage, Parking, Storing hazardous materials, Repair/maintenance Re-fuelling,

		Bulk concrete batching, Material stockpiles, and Lay down areas.
Reduction	Contractor	Establish and implement an Integrated Waste Management Strategy including avoidance, reduction, re-using, recycling and disposal, i.e. the production of hazardous waste can be avoided by providing drip trays, reduce waste by using the correct quantities, re-use concrete rubble as back fill or recycle steel off-cuts and dispose of non-hazardous solid waste at a registered municipal dump site.
Reduction	Contractor	Induct all labourers on the waste management strategy and enforce it through regular (at least weekly) toolbox talks.
Reduction	Contractor	Separate general, recyclable, natural (vegetation and soil/rock) and hazardous waste, and demarcate different containers for different waste types using colour codes.
Avoidance	Contractor	Do not litter, burn or bury waste on any property.
Avoidance	Contractor	A dustbin shall be available at each work front during working hours.
Avoidance	Contractor	The contractor shall dispose of general waste at a registered municipal dump site.
Avoidance	Contractor	The contractor shall return used oil to the supplier or an oil recycling company.
Avoidance	Contractor	Washing of construction plant and mechanical equipment including brushes shall not occur on site or in a watercourse, but shall be restricted to the main construction camp where adequate containment measures are in place.
Avoidance	Contractor	The contractor shall contain contaminated water from washing brushes in a conservancy tank until sufficient volume warrants disposal by a registered hazardous waste management company.
Reduction	Contractor	Remove ineffective danger tape/netting that has begun to litter the site or surrounding areas.
Avoidance	Contractor	Designate a temporary waste storage area, enclose it in a fence that cannot be breached by fauna, and provide sufficient scavenger proof dust bins with black bags inside the construction camp.
Reduction	Contractor	Imported material stockpiles shall be located outside the demarcated disturbed wetland system and on a disturbed site or other site approved by the ECO as a stockpile area.

Avoidance	Contractor	The contractor shall provide sufficient (1:10) chemical toilets, unless existing facilities can be used.
Avoidance	Contractor	Chemical toilets shall be located in the shade further from any watercourse.
Avoidance	Contractor	Use chemical toilets that contain the sewerage in a closed and removable 'tank', i.e. do not use open drums. Environmentally friendly toilets should also be considered e.g. E-loo's.
Avoidance	Contractor	All persons shall use only the provided facilities for sanitation.
Avoidance	Contractor	Chemical toilets shall be kept hygienic and cleaned daily.
Avoidance	Contractor	The contractor is prohibited from discharging waste water, including domestic water from sanitation facilities, and grey water from washing equipment or plant into a watercourse.
Reduction	Contractor	Re-fuelling with a mobile fuel bowser shall take place outside any watercourse.
Avoidance	Contractor	The contractor shall store hazardous material within a secure, safe and bunded facility at the construction camp.
Avoidance	Contractor	Use drip trays for refuelling, repair/maintenance work and all stationary construction plant and equipment that can leak, such as TLBs, compressors and generators.
Reduction	Contractor	Construction plant and equipment shall be kept in a good state of repair to reduce hydrocarbon leakages and emissions.
Reduction	Contractor	Emergency repairs or maintenance shall include procedures to minimize contamination of the ground.
Avoidance	Contractor	Remove topsoil from the area within the perimeter of the construction camp and stockpile separately for use during rehabilitation of the site.
Avoidance	Contractor	Do not cover spills with virgin soil. It merely increases the disposal cost for a greater volume of hazardous waste.
Rectification	Contractor	Immediately remove contaminated soil to the depth of penetration and temporarily store in a designated solid hazardous waste container until sufficient volume warrants disposal at a registered hazardous waste dump site. Alternatively, onsite treatment of contaminated soil should be considered with a registered hazardous waste management company.
Avoidance	Contractor	Do not mix concrete on open ground. Mix in a wheel barrow, a mixing tray or on a level plastic sheet.
Avoidance	Contractor	The contractor shall prevent the run-off of slurry or cement contaminated water from concrete/plaster mixing

		sites.
Rectification	Contractor	Break up all concrete hard pan layers and dispose of appropriately (at a legitimate dump site) or re-use the concrete.
Reduction	Contractor	The contractor shall implement appropriate procedures, such as the use of a ground cover, to prevent the contamination of the ground when handling hazardous materials, including re-fuelling.
Reduction	Contractor	Appropriate mitigation to control/reduce sediment input into watercourses shall be implemented during construction.
Reduction	Contractor	Trenches may not be excavated more than one day prior to installing the panel arrays and wiring.
Avoidance	Contractor	With the exception of search and rescue operations authorized by the ECO, no mammal, bird, reptile, invertebrate or fish shall be intentionally caught, harmed and/or killed.
Reduction	Contractor	As far as possible, commence construction (clearing) at the onset of the dry season in order to prevent erosion, siltation and wash-away of topsoil and sedimentation into the wetlands, seepage areas, drainage lines or rivers.

Impact 3: Loss of surface and ground water (quantity) directly through construction activities

Description

- Comments received from **Francois Taljaard**, Town Planner, Emthanjeni Municipality (**Table 8**); investigate potential impacts on the shortage of water - uncontrolled abstraction from a watercourse or aquifer (borehole) can reduce the natural reserve required for ecological function, such as when the demand for water during construction exceeds the permissible allocation.
- Water will be required for construction activities (i.e. mixing concrete and dust suppression of gravel roads) and for human consumption (drinking, sanitation and food preparation).
- Water required for human consumption and construction can be used excessively / wastefully.
- Borrow pits can trap surface water runoff or expose the water table.

Uncertainties & limitations with predicting this impact

- The magnitude of the impact, specifically the quantities of water required for human needs and construction activities, including the amount likely to be wasted, was not known.

Assumptions made when assessing the impact

- Dust suppression will be limited on gravel access roads as the construction vehicles will not generate significantly more dust than currently experienced by residents, especially if principle access is provided via the N10 tar road.
- South Africa is a dry country and water needs to be used sparingly - without waste.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	2	1	2	3	15
With	2	1	2	2	10

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	2	Negative	H
With	1	Neutral	

Reference (legal, scientific, social or other criteria)

- None

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- Water is a limited resource in South Africa. The potential impact of water loss associated with construction activities will be once-off and does constitute a permanent off-take from the resource. The extent to which it is replaceable is dependent on subsequent rainfall and regeneration of the resource.

Mitigations

Goal: Control water use during construction.

Objective(s) (including targets):

- To prevent the excessive use or wasteful use / loss of water.
- To use only the absolute minimum amount of water required for human needs and construction.

Impact 3: Wasteful loss of water (quantity) directly through construction activities		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor	Water leaks shall be repaired immediately upon being found.
Avoidance	Contractor	Water shall be used sparingly to prevent excessive run-off when undertaking dust suppression of roads.
Avoidance	Contractor	Water taps shall be closed when not in use.
Avoidance	Contractor	Water will be used within the thresholds stipulated in any Water Use Authorisation.
Reduction	Contractor	Water may be used interchangeably between surface and ground water resources to reduce impact on either system.

Impact 4: Loss of soil/rock (quantity) directly from erosion, sand mining, contamination and mixing

Description

- Pegging and surveying of alignments, the layout and design of structures and roads can influence or redistribute surface water flow patterns, cause erosion and sedimentation.
- Fences and walls aligned perpendicular to the contour can increase surface water runoff, cause erosion and sedimentation of a watercourse.
- Dirt roads can increase surface water runoff and cause erosion.
- Storm water outlets and culverts, if improperly or inadequately protected, can cause erosion to the receiving environment.
- Expansive, cleared areas are vulnerable to soil erosion.
- Water used to control dust on dirt roads can cause erosion if too much water is sprayed from the nozzles.
- Exposed areas from sand mining can erode.
- Soil stockpiles can erode, resulting in a loss of material for rehabilitation.
- Cleared and compacted areas (fence line, operations area, access roads, rack foundations, transformers and inverters, cables, substation and pylons) without grass tussocks to impede surface water run-off, can erode.
- Trenches can channel uninterrupted flow, thereby increasing run-off and causing erosion, particularly on steep slopes.
- Excess soil will be leftover once the drill holes are filled with the rack foundations and fence poles.
- Rehabilitated sites are susceptible to erosion.
- Topsoil can be mixed with cement, subsoil or pulverised by trucks.
- Loss of soil from mining of material to be used in foundation and mixing cement,
- Contamination of sand from spills and contamination of sand used as an absorbant in bunds and drip trays.

Uncertainties & limitations with predicting this impact

- The magnitude of the impact, specifically the amount of soil that will be infilled and removed, and lost to erosion and contamination, was not known.

Assumptions made when assessing the impact

- The placement of pylons and rack foundations for the panel mounting hardware will not alter existing surface water (rainfall runoff) flow patterns, as they cover a relatively small surface area.
- Erosion is a natural phenomenon and cannot be prevented without permanent and/or hard structures. It can, however, be controlled and reduced.
- Material will be sourced externally if the in situ material is not suitable (Personal Communication with JP de Villiers - Soventix SA).

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	2	2	3	4	28
With	2	1	2	2	10

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	2	Negative	H
With	2	Neutral	

Reference (legal, scientific, social or other criteria)

1. None

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- Lost topsoil cannot be replaced, unless imported from elsewhere, given the geological scale required for its creation through the weathering of parent material/rock. In the case of degraded or lost soil, organic modifications to in situ material will need to be undertaken to return fertility to the affected areas and promote vegetation growth.
- The extent of reversibility is dependent on the severity of the erosion, including the nature of the remaining *in situ* material, the amount of soil that has been exported from a site and whether or not the exported soil is recoverable. For example, soil washed from a gravel road into a mitre drain can be graded back onto the surface of the road, whereas soil that is washed from a gully into a water course is not recoverable and the source cannot be reinstated without significant intervention and cost. Although erosion has the potential to irreversibly change the relief, eroded sites can be stabilized through rehabilitation measures.

Mitigations

Goal: Control the loss of soil.

Objective(s) (including targets):

- To reduce erosion in the work area.
- To reduce and prevent the contamination of soil.
- To preserve the topsoil.
- To restrict sand mining to authorised areas.

Impact 4: Irretrievable loss of soil through erosion, sand mining, and contamination

Type of mitigation	Responsible authority	Mitigation
Control	Contractor Surveyor	The alignment and/or placement of anthropogenic obstacles, such as fence lines, operations buildings, access roads, transformers, inverters, and the substation, relative to the prevailing slope and existing surface water (rainfall runoff) flow patterns must not cause erosion and/or sedimentation of a watercourse.
Reduction	Contractor	Protect all areas susceptible to erosion by installing all the necessary, temporary and/or permanent mechanisms for controlling / diverting storm water run-off, dissipating water energy and encouraging infiltration as soon as possible.
Rectification	Contractor	Correct any cause of erosion at the onset thereof by controlling / diverting storm water run-off, immediately repairing and stabilizing / rehabilitating impacted areas in the most appropriate manner.
Reduction	Contractor	Construction plant and equipment shall be kept in good working order, to reduce the amount of soil lost to contamination.
Avoidance	Contractor	Drip trays shall be placed under stationary vehicles to reduce hydrocarbon spills.
Avoidance	Contractor	Sand or soil is prohibited from being used as an adsorbant in drip trays.
Avoidance	Contractor	Spills shall not be covered with sand or soil.
Avoidance	Contractor	The contractor shall obtain imported material from a licensed, commercial borrow pit, in the event that the quality of material sourced from on site borrow pits is unsuitable.
Avoidance	Contractor	The Contractor is prohibited from driving on topsoil stockpiles and windrows.
Avoidance	Contractor	Do not mix topsoil with cement. It is to be used for rehabilitation only.
Avoidance	Contractor	Topsoil shall be windrowed separately from the subsoil and opposite the working side of the works area.
Reduction	Contractor	Contain surface water run-off and loose sediment within excavations.

Impact 5: Loss / gain of terrestrial animals including mammals directly through clearing, smothering, poaching, colliding, trampling, excavation, and littering

Description

- Comments received from **Bonnie Schumann**, Senior Field Officer, Endangered Wildlife Trust (**Table 8**); these are potential areas for Critically Endangered Riverine Rabbits - Riverine Rabbit impacts – poaching, vehicles, open excavations and runaway fires pose a direct threat to the Riverine Rabbit. Indirect threats include improper handling (refueling, vehicle repairs, mixing cement or bitumen) and storage of hazardous substances (fuel tanks, cement bags, oil & bitumen drums), which can cause toxicity – the introduction of toxic or hazardous substances into an environment that may adversely affect the health of animals.
- The following identified by Dawn Cory Toussaint (Chiropteran Study): Disturbance to or destruction of roosting sites during construction activities. Light pollution during construction and operational phase may alter species composition, foraging patterns, reproductive success and predation rate. Alteration to commuting routes within the landscape as routes may be altered and some species may avoid the solar arrays all together, particularly the low-flying bat species. Habitat changes beneath the solar panels and the associated impact on prey insect communities may affect bat foraging patterns and areas. Changes in bat community, abundance and activity of bat species.
- Lighting at night can attract insects and bats, but may also discourage foraging by certain bat species – create a preferential habitat for one species at the expense of another.
- Electric fences can cause death or injury to mammals.
- Employees can harvest indigenous plants for muthi, firewood and poach animals.
- Littering can pose a risk of suffocation to wild animals (littering is likely to be more prevalent at designated eating/rest areas).
- Employees can burn fires to keep warm and runaway fires can destroy fauna and flora.
- Use of the existing road network will avert the need for off-road driving and protect flora and fauna that are normally less visible.
- Parking and driving carelessly can increase collisions with mammals, birds, reptiles, amphibians and insects – road kills.
- Designated parking areas will protect local flora and fauna.
- Animals can drown in water-filled borrow pits.
- Material stockpiles and lay down areas can be located in undisturbed areas, trampling or smothering tunneling, burrowing or nesting fauna in/on the ground.
- Clearing and grading (operations area, access roads, rack foundations, transformers and inverters, cables, substation and pylons); direct contact with fauna can cause injury or death. The impacts are exacerbated when the species affected are classified as protected, sensitive, rare, or threatened and endangered.
- Open excavations and drill holes can trap terrestrial fauna causing injury or death, including snakes.
- Animals can drown in water-filled excavations and drill holes.

- Solid and liquid waste can be harmful to fauna if swallowed/ingested or if the creature becomes entangled or impaled.

Uncertainties & limitations with predicting this impact

- The proposed development footprints have deliberately been located away from sensitive habitats such as watercourses and rocky ridges, to minimize conflict with local fauna and reduce impact on habitat.

Assumptions made when assessing the impact

- Fauna are highly mobile organisms, which can flee from dangers posed by construction activities. With the exception of smaller tunneling, burrowing or nesting fauna (in the ground or tree trunks), fauna will instinctively flee, upon an intrusion of their personal space, specifically the 'flight' zone, until the animal has extended the distance to its 'comfort' zone.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	2	3	2	3	21
With	2	1	2	1	5

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	2	Negative	H
With	2	Neutral	

Reference (legal, scientific, social or other criteria)

- Dawn Cory Toussaint (Chiropteran Specialist Study);
- Comments received from **Bonnie Schumann**, Senior Field Officer, Endangered Wildlife Trust

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- With the exception of critically endangered species or populations, the loss of life can be recovered through the reproduction of surviving individuals/populations.
- Effective rehabilitation and remediation can restore ecological function and habitat to affected species.

Mitigations

Goal: Control loss of terrestrial and avifauna

Objective(s) (including targets):

- To reduce harm to terrestrial and avifauna.
- To restore ecological function of areas affected by construction activities.

Impact 5: Loss of terrestrial animals including mammals and birds directly through clearing, smothering, poaching, colliding, trampling, excavation, and littering		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor ECO	With the exception of search and rescue operations authorized by the ECO, no mammal, bird, reptile, invertebrate or fish shall be intentionally caught and / or killed.
Reduction	Contractor	Drivers shall adhere to the relevant speed limit(s) at all times and restrict their movements to the existing and /or approved roadway or servitude.
Reduction	Contractor	The site will be kept tidy at all times. All waste shall be picked up daily.
Avoidance	Contractor	Designate a temporary waste storage area, enclose it in a fence that cannot be breached by fauna, and provide sufficient scavenger proof dust bins with black bags inside the construction camp.
Reduction	Contractor	Material stockpiles shall be located on a disturbed site or other site approved by the ECO.
Reduction	Contractor	Anthropogenic impacts must be minimized to reduce impacts on nocturnal species, including but not limited to reduced lighting that may influence bat foraging behavior.
Avoidance	Applicant	Fencing options must be utilised that provide adequate security to the plant, but will not result in animal mortality or require onerous vegetation clearing. Clearvu™ type fencing is preferred over electric fencing.
Avoidance	Contractor	Drilled holes and open excavations should not be left open for extended periods, and should be covered at night.
Avoidance	Contractor	No harvesting of natural resources may be permitted by contractor staff. Adequate induction training must be undertaken to sensitise the staff to this matter.
Avoidance	Contractor	Borrow pits should as far as possible have smooth slopes, allowing access and exit points to animals, especially when filled with water.

Impact 6: Replacement of terrestrial plants directly through the recruitment of alien and/or invasive plant species

Description

- Stockpiles are susceptible to alien and / or invasive plant infestation.
- Alien plants can also be introduced by importing foreign contaminated material for construction, including topsoil.
- The disturbance created by clearing activities within plant communities creates favourable habitat for the life history strategies of undesirable plant species¹. There is an ongoing threat for invasion because alien plants have effective dispersal mechanisms, such as birds. Cleared patches can become invaded and act as sources to colonize other vulnerable areas.

Uncertainties & limitations with predicting this impact

- The magnitude of the impact, specifically the extent and severity of the potential replacement of natural vegetation, was not known.

Assumptions made when assessing the impact

- Material (soil) will be imported, but recently excavated subsoil should not introduce any foreign seeds, which are mostly found within the topsoil horizon.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	2	2	3	4	28
With	2	1	2	2	10

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	2	Negative	H
With	1	Neutral	

Reference (legal, scientific, social or other criteria)

1. Northern Cape Nature Conservation Act, 2009 (No. 9 of 2009);
2. Conservation of Agricultural Resources Act (No 43 of 1983) and the regulations dealing with declared weeds and invader plants as amended from time to time;
3. National Environmental Management: Biodiversity Act – Alien and Invasive Species Regulations, GG No. 37886, GN No. 599, 1 August 2014.

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- Reversibility is influenced by the extent and longevity of alien plant invasion. If controlled timeously the impact can be negligible. However, if allowed to grow unabated, alien invasive species can replace entire plant communities with homogeneous stands. Biodiversity is significantly reduced and ecosystem function is altered. In the latter case, rehabilitation will require significant intervention and cost.

Mitigations

Goal: Control the replacement of indigenous vegetation.

Objective(s) (including targets):

- To prevent the maturation and reproduction of weed, invader and exotic plant species from occurring on any land that is disturbed during construction.

Impact 6: Replacement of terrestrial plants directly through the establishment of alien plant species		
Type of mitigation	Responsible authority	Mitigation
Reduction	Contractor	The contractor shall search for weed, invader and exotic plant species on all disturbed sites every two weeks during construction.
Rectification	Contractor	The contractor shall immediately remove weed, invader and exotic plant species upon being identified on all areas that are disturbed by construction activities including stockpiles.
Rectification	Contractor	The contractor shall collect and destroy all seeds of weed, invader and alien plant species occurring within the servitude.

Impact 7: Loss / gain of terrestrial plants directly through the clearing, smothering, trampling, and harvesting of plants

Description

- Comments received from **Jacoline Mans**, Chief Forester, DAFF (**Table 8**); investigate potential impacts on NFA listed protected trees & obtain flora and fauna permits where necessary - clearing and grading (operations area, access roads, rack foundations, transformers and inverters, cables, substation and pylons); direct contact with flora can cause injury or death. The impacts are exacerbated when the species affected are classified as protected, sensitive, rare, or threatened and endangered.
- Construction activities, such as clearing, may extend beyond the development footprint, known as construction creep.
- The surveying and pegging of footprints can disturb immovable flora. i.e. operations buildings, access roads, fence lines, parking areas, transformers, inverters, pylons, rack foundations and the substation.
- Excessive sanitation at latrine sites can kill plants.
- Excessive traffic and dust can smother plants growing on the verge of gravel access roads.
- Vegetation stockpiles, material stockpiles and lay down areas can be located in undisturbed areas, smothering living plants.
- Concrete work, specifically mixing on bare ground can smother living plants and create a hard pan layer that prevents recovery.
- The movement of people, driving and parking of vehicles, and location of other construction equipment can trample plants.
- The immigration of contractors and labourers increases the risk of plants being harvested for firewood and / or traditional medicine.

Uncertainties & limitations with predicting this impact

- The number of immigrants (labourers) on to the construction site is unknown.
- The amount of concrete work is expected to be low, but undefined.

Assumptions made when assessing the impact

- Material will be imported from a commercial and licensed source where the material is not deemed suitable from the on-site borrow pits.
- Dust is unlikely to significantly impact plants as limited dust suppression will be implemented and existing roads, and possibly the surfaced N10 tar road, will largely be used.
- In the event of any clear and grub operations, the topsoil will be stockpiled on unaffected grassed areas. There will be no vegetation stockpiles.
- Limited temporary access roads will be constructed, and maintained as two-tracks and not graded or paved.
- A suitably qualified ECO or specialist will first survey the affected footprints and plants of conservation concern will be translocated or protected in situ.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	2	3	2	3	21
With	2	1	2	2	10

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	2	Negative	H
With	1	Neutral	

Reference (legal, scientific, social or other criteria)

- The National Forests Act, 1998 (No. 84 of 1998), including Schedule in Government Notice No. 1042, dated 10 September 2004 and comments received from **Jacoline Mans**, Chief Forester, DAFF (**Table 8**); investigate potential impacts on NFA listed protected trees & obtain flora and fauna permits where necessary.
- National Environmental Management: Biodiversity Act, 2004 (No. 10 of 2004).
- National Environmental Management: Biodiversity Act – Threatened or protected species regulations, GG No. 38600, GN No. 255, 31 March 2015;
- DEA (2011), National list of ecosystems that are threatened and in need of protection. GN 1002, GG 34809, 9 December 2011.
- Northern Cape Nature Conservation Act, 2009 (No. 9 of 2009).

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- The Solar PV Plant will be on raised stands, consequently, it may be possible to replace lost vegetation through appropriate rehabilitation measures. Temporary construction footprints such as access roads and the construction camp can also be rehabilitated. The rate of recovery will depend on the nature of the rehabilitation, prevailing weather conditions, and the diversity and density of local fauna/measures taken.

Mitigations

Goal: Control the loss of vegetation.

Objective(s) (including targets):

- To avoid the unnecessary destruction of flora resulting from construction activities.

Impact 7: Loss of terrestrial plants directly through the clearing, smothering, harvesting, trampling and cutting of plants

Type of mitigation	Responsible authority	Mitigation
Avoidance	Applicant Contractor	Clearing activities may not commence until the relevant licenses / permits for disturbing or destroying any protected species have been obtained from the appropriate authorities (DAFF, DEA, and Provincial Authority).
Avoidance	Ecologist	Prior to clearing activities, a qualified ecologist must identify and demarcate plants of conservation concern that can be successfully and feasibly relocated from all the areas that are to be cleared.
Reduction	Contractor	The contractor may not dump any material onto living plants unless it is on a site that has been searched for plants of conservation concern by the Ecologist / ECO and approved as a stockpile or laydown area.
Avoidance	Contractor	The works area must be clearly demarcated to ensure no construction creep takes place increasing the impact on vegetation.
Avoidance	Contractor	Do not mix concrete on open ground. Mix in a wheel barrow, a mixing tray or on a level plastic sheet. Break up all hard pan layers.
Reduction	Contractor	All contractors and their labourers must be inducted before commencing work. The induction must include mitigations identified in this report (all aspects regarding their actual and potential interaction with the environment).
Avoidance	Contractor	No dry wood, living plant or part thereof may be harvested from any plant community.
Avoidance	Contractor	The movement of construction vehicles will be restricted to existing roads and certain demarcated areas (to turn around or passing lanes).
Reduction	Contractor	Dust fallout must be managed to reduce the potential for consequent smothering and loss of flora.

Impact 8: Loss / gain of aquatic plants

Description

- Comments from **Jacoline Mans**, Chief Forester, DAFF (**Table 8**); investigate the impacts on the riparian vegetation - the footprint of the substation and / or some pylons / poles will include a drainage system.

Uncertainties & limitations with predicting this impact

- The ecological functionality and sensitivity of watercourses outside of the development nodes have not been defined.

Assumptions made when assessing the impact

- Only limited work will be required within watercourses, which are predominantly of an ephemeral nature, and support limited aquatic biota.
- The development footprint will be outside the watercourse boundary (excluding pylon footings), including a 100 m buffer zone, which is deemed adequate to avoid potential construction & operational impacts on the watercourse.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	3	2	3	2	16
With	1	1	2	1	4

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	2	Negative	M
With	1	Positive	

Reference (legal, scientific, social or other criteria)

- DWAF (2008). Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas, prepared by M. Rountree, A. L. Batchelor, J. MacKenzie and D. Hoare. Stream Flow Reduction Activities, Department of Water Affairs and Forestry, Pretoria, South Africa.
- S.F. de Wet & H. van den Berg. November 2016. Soventix grazing, soils and wetland assessment scoping report.

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- The rate of recovery will depend on the nature of the rehabilitation, prevailing weather conditions, and the diversity and density of local aquatic flora and measures taken.

Mitigations

Goal: Control loss of aquatic plants.

Objective(s) (including targets):

- To avoid the unnecessary destruction of aquatic plants resulting from construction activities.

Impact 8: Loss/gain of aquatic plants		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor Applicant	No constructing activities to take place around or next to the aquatic areas.
Reduction	Contractor Applicant	Maintain the 100 m buffer around aquatic areas.

Impact 9: Loss / gain of aquatic habitat

Description

- The footprint of some of the pylons / poles will fall within a drainage system¹.

Uncertainties & limitations with predicting this impact

- The exact alignment of the pylons and the affected sections of the watercourse are not yet defined.

Assumptions made when assessing the impact

- The construction activities associated with the installation of overhead powerline pylons will not be extensive.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	2	2	4	2	16
With	1	1	2	1	4

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	2	Negative	H
With	1	Positive	

Reference (legal, scientific, social or other criteria)

1. Comments from **Jacoline Mans**, Chief Forester, DAFF (**Table 8**); investigate the impacts on the riparian vegetation.
2. DWAF (2008). Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas, prepared by M. Rountree, A. L. Batchelor, J. MacKenzie and D. Hoare. Stream Flow Reduction Activities, Department of Water Affairs and Forestry, Pretoria, South Africa.
3. S.F. de Wet & H. van den Berg. November 2016. Soventix grazing, soils and wetland assessment scoping report.

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- The rate of recovery will depend on the nature of the rehabilitation, prevailing weather conditions, and the diversity and density of local habitats taken.

Mitigations

Goal: Avoid impacting the aquatic habitat.

Objective(s) (including targets):

- To have minimal impact on the aquatic habitat.

Impact 9: Loss/gain of aquatic habitat		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor	The undisturbed / natural vegetation units, such as the riparian habitats, which fall outside permanent and temporary construction footprints, must be designated and demarcated as no-go areas during construction.
Reduction	Contractor	Once impacted upon, disturbed habitats must be rehabilitated immediately before further disturbance.

Impact 10: Loss / gain of terrestrial habitat

Description

- Habitat will be lost within the operational footprints, the largest or most significant being internal access roads.
- Surveying and pegging can place footprints in sensitive habitats.
- Work related activities extending beyond the footprint - called construction creep - can disturb habitats.
- Sand mining destroys natural habitats.
- Spoil, soil, mulch or any other stockpiles, if left on site will degrade natural habitat.
- Habitat is destroyed by clearing.
- Illegal dumping will remove natural habitat.
- Concrete work, specifically mixing on bare ground can smother living plants and create a hard pan layer that prevents recovery.
- Contaminated areas including fuel or oil spills will remove natural habitat.

Uncertainties & limitations with predicting this impact

- Suitable faunal habitats within the footprint has not been established, nor the flora sensitivities of each footprint.

Assumptions made when assessing the impact

- It is assumed that the sensitive construction procedures committed to by the developer can be effectively implemented.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	3	3	4	4	40
With	2	2	3	3	21

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	3	Negative	M
With	2	Neutral	

Reference (legal, scientific, social or other criteria)

- Terrestrial Ecology Scoping Assessment by Simon Todd (outstanding).

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- The rate of recovery will depend on the nature of the rehabilitation, prevailing weather conditions, and the diversity and density of the terrestrial habitats affected.

Mitigations

Goal: Avoid change of the terrestrial habitat.

Objective(s) (including targets):

- To have minimal change to the terrestrial habitat.

Impact 10: Loss/gain of terrestrial habitat		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor	The undisturbed / natural vegetation units, such as the terrestrial habitats, which fall outside permanent and temporary construction footprints must be designated and demarcated as no-go areas during construction.
Rectification	Contractor	Once impacted upon, disturbed habitats must be rehabilitated immediately before further disturbance.
Avoidance	Contractor	Development of access road and temporary tracks must be limited to those absolutely necessary.
Avoidance	Contractor	Soil may only be obtained from the three already operational borrow pits.
Avoidance	Contractor	Suitable designated areas must be demarcated as laydown and stockpile areas, to reduce impacts on terrestrial habitat.
Avoidance	Contractor	No concrete work may take place directly on the ground or on live vegetation.

Impact 11: Transformation and fragmentation of terrestrial habitat

Description

- Surveying and pegging for the layout of construction site can be disruptive to local migration by causing fragmentation.
- There is a potential for habitat transformation within the fenced off areas because they will no longer be influenced by natural drivers like selective grazing pressures and fire.
- Fenced areas can cause fragmentation.
- Habitat fragmentation is usually associated with linear activities such as fences and roads.
- Restricted access and management can prevent natural drivers, such as selective grazing pressures and fire from influencing species composition within the local plant community.
- Roads can act as firebreaks and prevent natural drivers, such as fire from influencing species composition within the local plant community.
- Roads that alter surface water flow patterns within the local landscape will redistribute the availability of run-off as a source of water to plants - this impact is more significant in arid areas.
- Roads can cause fragmentation.

Uncertainties & limitations with predicting this impact

- There are no known case studies quantifying the level of habitat fragmentation and vegetation transformation

Assumptions made when assessing the impact

- The fact that sheep will be used as a vegetation management tool within the fenced-off footprint, it is assumed that they will largely mimic the ecosystem drivers outside the plant, as fire doesn't play a large role in this system.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	3	3	4	4	40
With	2	2	3	3	21

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	3	Negative	M
With	2	Neutral	

Reference (legal, scientific, social or other criteria)

- Terrestrial Ecology Scoping Report (outstanding).

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- The impacts may be reversed if sheep grazing shows itself as a successful management tool, as they will import indigenous plant seeds via their coats and faeces.

Mitigations

Goal: To avoid transformation and fragmentation of terrestrial habitat.

Objective(s) (including targets):

- Preserve the terrestrial habitat.

Impact 11: Transformation and fragmentation of terrestrial habitat		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor	Permanent and temporary construction footprints must be designated and sensitive terrestrial habitats demarcated as no-go areas during construction.
Reduction	Contractor	Once impacted upon, disturbed habitats must be rehabilitated immediately before further disturbance.
Reduction	Applicant	Sheep grazing must continue within the fenced-off footprint to continue a similar grazing regime both within and outside the plant footprint.
Avoidance	Contractor	Access road and temporary tracks must not allow unconstrained surface water runoff, leading to erosion and localised export of soil.

Impact 12: Socio-economic

Description

- Comments received from **Francois Taljaard**, Town Planner, Emthanjeni Municipality (**Table 8**); investigate potential impacts on the shortage of water - uncontrolled abstraction from a watercourse or an aquifer can reduce the amount of water that is available to downstream users.
- Comments received from **Francois Taljaard**, Town Planner, Emthanjeni Municipality (**Table 8**); the disposal or processing of packaging material must be addressed in the EIA. Packaging material is currently being used in the townships for additions to houses, which is illegal and creates a fire hazard.
- Increased security can protect trespassers from being electrocuted.
- New employment opportunities and influx of workers could disrupt public transport.
- There may not be enough local accommodation.
- Driving recklessly or at speed can kill or injure people.
- Untreated water can cause health problems when drunk by staff.
- People can drown in water-filled borrow pits.
- Excavations can cause injury to people who fall inside.
- Improper handling, storage and disposal of waste can cause toxicity – it is the introduction of toxic or hazardous substances into an environment that may adversely affect the health of people.
- Burning waste can cause smoke inhalation.
- Improper handling & storage hazardous substances can cause toxicity – the introduction of toxic or hazardous substances into an environment that may adversely affect the health of people.
- Inhaling dangerous fumes can be harmful to people.
- Temporary workers will lose their employment.
- Restricted access may limit the practice of similar, neighbouring agricultural land uses like grazing.
- Spoil, soil, mulch or any other stockpiles, if left on site will interfere with certain land use practices like agriculture.
- Cleared areas that are not rehabilitated are susceptible to degradation and loss of certain land uses like agriculture and conservation.
- Illegal dumping will result in the loss of certain land uses like agriculture and conservation.
- Contaminated areas will result in a loss of certain land uses like agriculture and conservation.
- Lighting can help improve security to prevent theft at night.
- Increased security can protect the assets from theft.
- New (temporary) jobs for local residents will increase income and buying power within the local community.
- An increase demand for local accommodation will benefit small hotels.

- Employees may burn fires to keep warm and runaway fires can cause loss of livestock and property.
- Accessibility on site is required for maintenance purposes.
- Driving recklessly or at speed can cause an accident and damage to property.
- Uncontrolled abstraction from a watercourse or an aquifer can reduce the amount of water that is available for downstream water uses, including irrigation.
- Areas that are deprived of their soil through mining, ecological functions and land use cannot generate ecosystem goods and services and tangible economic benefits including income from conservation or farming.
- Ecological functions and land use required to generate ecosystem goods and services and tangible economic benefits including income from conservation or farming.
- Excess waste puts a burden on existing landfill sites.
- Hazardous waste, particularly large amounts of it is expensive to dispose of.
- Illegal dumping sites cannot retain the ecological functions and land use required to generate ecosystem goods and services and tangible economic benefits including income from conservation or farming.
- Contamination will disturb the natural habitat, diluting or interfering with the overall ecological functioning that sustains ecosystem goods and services.
- It is very expensive to rehabilitate contaminated areas.
- The power may need to be turned off when the solar PV plant is connected to the existing Eskom grid, temporarily disrupting the supply of electricity to local communities.
- Comments from the Social Impact Assessment Report by Isle Dr Ilse Aucamp of Equispectives Research and Consulting Services - Impacts of traffic on people – dust, noise, safety – from a social and nuisance perspective. Impacts on livelihoods – of landowners. Safety of community – possible increase in crime due to increased number of strangers in community. Negative community relations due to conduct of contractors/representatives of Soventix. Impacts of construction camp – HIV/AIDS, movement of people etc. (This impact would only occur if there is a construction camp). Influx of people – also possible social disintegration and cultural differentiation, increase in HIV/AIDS etc. Creation of jobs and other economic opportunities. For some stakeholders their sense of place may change.

Uncertainties & limitations with predicting this impact

- Identified concerns from local residents have not been forthcoming thus far in the Public Participation Process.

Assumptions made when assessing the impact

- It is unlikely that any significant impacts on the receiving social environment will result from the proposed development as the area will be minimally disturbed and positive employment impacts will result.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	2	3	2	2	14
With	2	2	2	2	12

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	3	Negative	H
With	2	Neutral	

Reference (legal, scientific, social or other criteria)

- Equispectives Research & Consulting Services. November 2016. Social Scoping Report for Soventix Solar PV project.

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- Following the construction period there will be a loss of employment, followed by the retention of a few operational staff.

Mitigations

Goal: Address social concerns.

Objective(s) (including targets):

- To avoid creating false hope where job creation opportunities are concerned.

Impact 12: Socio-economic		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor	Water must be used sparingly to ensure no depletion of water resources take place to the detriment of downstream water users and other ground water users.
Avoidance	Contractor	Adequate provision must be made for employment seekers, to avoid uncontrolled access to the property.
Avoidance	Contractor	Adequate potable water must be supplied to the labour force throughout the construction process.
Avoidance	Contractor	Open borrow pits and quarries must be fenced-off when construction activities are taking place, to ensure the safety of unsuspecting public or job seekers.

Avoidance	Contractor	AIDS/HIV awareness training must be undertaken to ensure that the labour force is well informed on the matter.
Avoidance	Contractor	Noise, dust and water impacts must be avoided that may affect both the labour force and surrounding landowners and users.
Avoidance	Contractor	Open fires must be prohibited during the construction process for fear of runaway fires.
Avoidance	Contractor	Waste, especially waste packaging from inter alia the solar panels, must be well managed to ensure it does not infiltrate the surrounding environment.
Avoidance	Contractor	All construction activities must be carried out in an environmentally sensitive manner to ensure no deterioration in the agricultural potential of the land results.

Impact 13: Cultural

Description

- Placement of construction areas including toilets can be visually intrusive to sensitive receptors.
- Lighting at night can be visibly intrusive in remote areas.
- High walls and fences can be visually intrusive by visibly altering the natural landscape.
- Soil mining creates visibly intrusive scars in the natural landscape.
- Unwanted stockpiles can be visually intrusive in the natural landscape.
- Cleared areas are visibly intrusive in the natural landscape.
- Solid waste can be blown away and into the landscape.
- Waste contaminated or storage areas and illegal dumps can be visibly intrusive in a natural landscape.
- Surveying and pegging of temporary footprints can disturb sites of historical significance, i.e. Graves.
- Clearing and other earthmoving activities (such as excavating, drilling) can reveal and disturb heritage resources¹, sites of archaeological significance and graves.

Uncertainties & limitations with predicting this impact

- None

Assumptions made when assessing the impact

- It is unlikely that any significant impacts on heritage resources will result from the proposed development, as initial indications are that limited heritage sites are present on the proposed footprints.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	2	3	2	2	14
With	2	2	2	2	12

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	3	Negative	H
With	2	Neutral	

Reference (legal, scientific, social or other criteria)

1. National Heritage Resources Act (No 25 of 1999).

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- Heritage resources are irreplaceable.

Mitigations

Goal: Address social concerns.

Objective(s) (including targets):

- Zero loss of heritage resources and all finds are to be recorded.

Impact 13: Cultural		
Type of mitigation	Responsible authority	Mitigation
Reduction	Contractor	<p>Include an awareness of heritage resources in the environmental induction. Categories of heritage resources include, <i>inter alia</i>:</p> <ul style="list-style-type: none"> • Evidence of archaeological sites or remains include remnants of stone-made structures, indigenous ceramics, bones, stone artifacts, ostrich eggshell fragments, marine shell and charcoal/ash concentrations. • Archaeological or paleontological sites over 100 years old, • Sites of cultural significance associated with oral histories, • Significant cultural landscapes or viewsapes, • Burial grounds, unmarked human burials, graves of victims of conflict, and/or graves older than 60 years, • Structures older than 60 years, • Fossils, etc.
Avoidance	Applicant Contractor	All formal and informal cemeteries and burials must be left in situ and not be disturbed. If this is not possible, a permit must be applied for in terms of Section 36 of the NHRA (Act 25 of 1999), and is subject to mandatory public consultation.
Avoidance	Contractor	In the event of discovering a heritage resource, stop reconstruction activities and alert the SAHRA Archaeology, Palaeontology and Meteorites (APM) Unit immediately. Jenna Lavin, Heritage Officer (Tel: 021 462 4502, Fax: 021 462 4509, Email: jlavin@sahra.org.za).
Avoidance	Contractor	Contact a professional archaeologist or palaeontologist, depending on the nature of the finds, as soon as possible to inspect the findings.
Reduction	Contractor	The Contractor shall contact Eskom before commencing with any construction to determine the presence and location of any underground electrical cables.
Reduction	Contractor	The Contractor shall contact Eskom in the event of discovering any illegal connections and request Eskom to make the area safe prior

		to commencing work in the affected area.
--	--	--

Impact 14: Degradation – Site closure and rehabilitation

The degradation of disturbed sites can result from erosion and plant replacement.

Description

- Rehabilitated sites can cause erosion and, if adjacent to or within a watercourse, sedimentation.
- Disturbed sites will comprise mostly cleared/denuded areas that are vulnerable to degradation, including erosion, leading to a loss of biodiversity and ecosystem functions and processes.
- New growth on rehabilitated sites can be overgrazed by mammals.
- Rehabilitation that is not in accordance with the natural plant communities of the area can result in the introduction of non-indigenous plants.
- Disturbed areas, including those recently rehabilitated by the contractor are susceptible to weed, invader and alien plant² recruitment and the replacement of indigenous plant communities if not controlled.
- Rehabilitation can be expensive, but will depend on the extent to which the contractor mitigated his impacts during construction.
- The income generation or buying power of local residents employed during construction will return to 'normal'.
- Permanent contracting staff will cease renting accommodation in the area.
- All temporary anthropogenic influences required during construction can clutter the site and make it look untidy.

Uncertainties & limitations with predicting this impact

- The magnitude of the impact, specifically the extent and severity of the erosion and sedimentation, was not known.
- The magnitude of the impact, specifically the extent of the invasion onto rehabilitated areas, was not known.

Assumptions made when assessing the impact

- The disturbance including areas that are vulnerable to alien plant invasion will be restricted to the plant servitudes. Disturbed areas are likely to degrade if left alone.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	2	2	3	3	21
With	2	1	2	2	10

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	2	Negative	H
With	1	Neutral	

Reference (legal, scientific, social or other criteria)

1. The Principles of NEMA require that a proponent is responsible for any development s/he has initiated from the beginning to the end of the project (“From the cradle to the grave”). This responsibility is passed on from one title deed holder to the next. In line with this principle a rehabilitation plan has got to be drawn up to specify how the area will be rehabilitated once the project has ceased for whatever reason.
2. Conservation of Agriculture Resources Act (Act 43 of 1983) as amended, and administered by the DALA, including the following:
 - Section 15A(1) of CARA, 1983, as amended: Category 1 plants may not occur on any land or inland water surface other than in biological control reserves.
 - Section 15A(2) of CARA, 1983, as amended: A land user shall control any category 1 plants that occur on any land or inland water surface in contravention of the provisions of sub-regulation (1) by means of the methods prescribed in regulation 15E.
 - Section 15B(1) of CARA, 1983, as amended: Category 2 plants may not occur on any land or inland water surface other than a demarcated area or a biological control reserve.
 - Section 15B(8) of CARA, 1983, as amended: A land user shall control any category 2 plants that occur on any land or inland water surface in contravention of the provisions of sub-regulation (1) by means of the methods prescribed in regulation 15E.
 - Section 15C(1) of CARA, 1983, as amended: Category 3 plants shall not occur on any land or inland water surface other than in a biological control reserve.
 - Section 15C(3)(a) of CARA, 1983, as amended: No land user shall allow category 3 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland.

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- Disturbed areas can be rehabilitated. The cost thereof will depend on the severity and extent of the degradation.
- The extent of reversibility is dependent on the severity of the erosion, including the nature of the remaining *in situ* material, the amount of soil that has been exported from a site and whether or not the exported soil is recoverable. For example, soil washed from a gravel road into a mitre drain can be graded back onto the surface of the road, whereas soil that is washed from a gully into a water course is not recoverable and the source cannot be re-instated without significant intervention and cost. Although erosion has the potential to irreversibly change the relief, eroded sites can be stabilized through rehabilitation measures.

- If controlled timeously the impact of alien plant species can be negligible. However, if allowed to grow unabated, alien invasive species can replace entire plant communities with homogeneous stands. Biodiversity is significantly reduced and ecosystem function is altered. In the latter case, rehabilitation will require significant intervention and cost.

Mitigations

Goal:

Facilitate the natural rehabilitation of disturbed areas and control the replacement of indigenous vegetation by weed, invader and exotic plant species.

Objective(s) (including targets):

- To avoid long-term degradation.
- To reduce erosion of and rehabilitated access roads.
- To prevent the maturation and reproduction of weed, invader and exotic plant species from occurring on any land that is rehabilitated after construction.

Impact 14: Degradation – Site closure and rehabilitation		
Type of mitigation	Responsible authority	Mitigation
Rectification	Contractor	Bulk shape the areas where material is introduced to mimic or blend in with the surrounding, natural topography. Do not fine shape or rake because an uneven surface will impede surface water run-off and facilitate infiltration.
Reduction	Contractor	Ensure storm water run-off is adequately controlled on disturbed sites before rehabilitating them (ripping, replacing the topsoil and mulching/brush packing), i.e. cut-off berms.
Rectification	Contractor	Topsoil shall be returned to the source areas during rehabilitation of the pipeline servitudes.
Rectification	Contractor	Ensure a quick and adequate cover with indigenous and local grass species on all pipeline servitudes.
Avoidance	Contractor	Kikuyu grass (<i>Pennisetum clandestinum</i>) is a highly invasive plant that threatens wetland habitats and must not be used in areas adjacent to wetland habitats and drainage lines. Non-invasive indigenous grasses such as <i>Cynodon dactylon</i> must be used.
Reduction	Contractor	The Contractor shall monitor the rehabilitated servitudes for the duration of the contract defects and liability period for signs of erosion.
Rectification	Applicant Contractor	If erosion is found to occur during the aforesaid monitoring, the Contractor / Applicant shall immediately correct (the 'source') and repair (the 'symptom') the erosion using method(s) that are an improvement on the mitigations proposed in the EMP or on the unsuccessful mitigations originally used on site.
Reduction	Contractor	The rehabilitated solar plant servitudes shall be monitored at least

	Applicant	twice during the summer rainfall season for two years following the completion of the PV Solar Plants for the recruitment of weed, invader and alien plant species.
Rectification	Contractor Applicant	The Contractor /Applicant shall immediately uproot, cut or debark weed, invader and alien plant species upon being identified.
Rectification	Contractor Applicant	The Contractor/Applicant shall collect and destroy all seeds of weed, invader and alien plant species occurring within disturbed and/or rehabilitated areas.
Avoidance	Applicant	The introduction of sheep into the solar panel plant will be done in accordance with the grazing capacity management plan that will be formulated.

Operational Phase

Impact 1: Human influence (staff conduct and movement)

Description

- Litter can get washed into storm water drains and watercourses.
- Employees can harvest indigenous plants for muthi, firewood and poach animals.
- Littering can pose a risk of suffocation to wild animals (littering is likely to be more prevalent at designated eating/rest areas).
- Employees can burn fires to keep warm and runaway fires can destroy fauna and flora.
- New (permanent) jobs for local residents will increase income and buying power within the local community.
- Employees can burn fires to keep warm and runaway fires can cause loss of livestock and property.
- Littering is visually intrusive.

Uncertainties & limitations with predicting this impact

- None.

Assumptions made when assessing the impact

- Once construction is over, only operational staff will be on-site, whose impact will be negligible.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	3	3	3	3	27
With	1	2	3	2	12

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	2	Negative	H
With	1	Positive	

Reference (legal, scientific, social or other criteria)

- None

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- If staff conduct is adhered to, any impact caused will be reversible.

Mitigations

Goal: To avoid human influence on degrading the environment.

Objective(s) (including targets):

- Minimize human influence on environmental degradation.

Impact 1: Human influence (staff conduct and movement)		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Employees	No dry wood, living plant or part thereof may be harvested from any plant community.
Reduction	Employees	No burning, including of waste for any reason.
Rectification	Employees	Follow housekeeping rules in order to avoid littering.

Impact 2: Consumption (energy, water, and other resources)

Description

- Comments received from **Francois Taljaard**, Town Planner, Emthanjeni Municipality (**Table 8**); investigate potential impacts on the shortage of water - uncontrolled abstraction from a watercourse or aquifer (borehole) can reduce the natural reserve required for ecological function, such as when the demand for water during operation exceeds the permissible allocation.
- Solar PV cells do not use water for generating electricity, but they do need to be cleaned. Water will also be required for human consumption (drinking, sanitation and food preparation).
- Water required for human consumption and maintenance of the solar panels can be used excessively/wastefully.

Uncertainties & limitations with predicting this impact

- None.

Assumptions made when assessing the impact

- South Africa is a dry country and water needs to be used sparingly - without waste.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	3	2	4	3	27
With	2	1	3	2	12

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	2	Neutral	H
With	1	Positive	

Reference (legal, scientific, social or other criteria)

- None

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- Water required for human consumption and construction can be used sparingly in order to reverse the impacts.

Mitigations

Goal: Avoid wasteful use of resources.

Objective(s) (including targets):

- Use resources sparingly and sustainably.

Impact 2: Consumption (energy, water, and other resources)		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Employees	Water leaks shall be repaired immediately upon being found.
Avoidance	Employees	Water shall be used sparingly even for consumption purposes.
Avoidance	Employees	Water taps shall be closed when not in use.
Avoidance	Employees	Water-saving showerheads shall be used ,where relevant.
Reduction	Employees	Reuse and recycling of water could be considered for rehabilitating and watering purposes.

Impact 3: Maintenance

Description

- Gravel roads and fences are also sources of erosion if not maintained or managed because they channel uninterrupted flow of surface water runoff.

Uncertainties & limitations with predicting this impact

- None.

Assumptions made when assessing the impact

- None.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	2	2	4	3	24
With	1	1	2	2	8

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	1	Neutral	H
With	1	Positive	

Reference (legal, scientific, social or other criteria)

- None

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- None.

Mitigations

Goal: To ensure continual environmental sustainability.

Objective(s) (including targets):

- To avoid long-term degradation.
- To promote ecological function

Impact 3: Maintenance		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Applicant	All fences have to be maintained to ensure continued operational efficiency. All incidents of animals breaking through the fence must be reported to the Office Manager for record purposes.
Avoidance	Applicant	The effectiveness of the system / s shall be investigated after establishment.
Avoidance	Applicant	Areas disturbed and rehabilitated during construction shall be monitored for signs of erosion and if found to occur, immediately corrected ('source') and repaired ('symptom').
Avoidance	Applicant	Areas disturbed during construction shall be monitored for the recruitment of weed, invader and alien plant species and controlled immediately upon being found to occur.

Impact 4: Lighting to create visibility at night

Description

- Lighting can cause light pollution in remote areas.
- Lighting at night can attract insects and bats.
- Lighting can help improve security to prevent theft at night.
- Lighting at night can be visibly intrusive in remote areas.

Uncertainties & limitations with predicting this impact

- The level of lighting at night for inter alia security purposes is uncertain.

Assumptions made when assessing the impact

- Only the main office and security guards office will be lit at night.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	3	2	3	2	16
With	1	1	2	1	4

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	1	Neutral	H
With	1	Neutral	

Reference (legal, scientific, social or other criteria)

- None

Impact reversibility / The degree to which the impact may cause an irreplaceable loss of resources

- Effective lighting will limit visibility to surrounding landowners and users.

Mitigations

Goal: To supply adequate lighting to secure the construction footprint with limited dispersal to the surrounding area.

Objective(s) (including targets):

- To ensure that the lighting does not disperse beyond the construction footprint.

Impact 4: Lighting to create visibility at night		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor	Install lighting that focusses light onto the footprint alone.
Reduction	Contractor	Utilise light sources that are energy efficient with reduced attraction for local insect life.

Impact 5: Waste management

Description

- Solid and liquid waste can contaminate the ground (litter, spillage) if improperly handled, stored or disposed.
- Improper handling, storage or disposal of waste can cause toxicity – the introduction of toxic or hazardous substances into a watercourse, i.e. acidification, the increased acidity of waterways through leeching (i.e. acid forming substances).
- Illegal dumping will remove natural habitat.
- Improper handling, storage and disposal of waste can cause toxicity – is the introduction of toxic or hazardous substances into an environment that may adversely affect the health of people.
- Burning waste can cause smoke inhalation.
- Illegal dumping will result in the loss of certain land uses like agriculture and conservation.
- Excess waste puts a burden on existing landfill sites.
- Hazardous waste, particularly large amounts of it is expensive to dispose of.
- Illegal dumping sites cannot retain the ecological functions and land use required to generate ecosystem goods and services and tangible economic benefits including income from conservation or farming.
- Solid waste can be blown away and into the landscape.
- Waste contaminated or storage areas and illegal dumps can be visibly intrusive in a natural landscape.

Uncertainties & limitations with predicting this impact

- None.

Assumptions made when assessing the impact

- The Municipality will collect waste on a weekly basis and dispose of the waste at a designated landfill site.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	3	2	3	3	24
With	2	1	2	2	10

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	2	Neutral	H
With	1	Positive	

Reference (legal, scientific, social or other criteria)

- None

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- Dependent on the nature and extent of the impact.

Mitigations

Goal: To ensure sound waste management practices.

Objective(s) (including targets):

- To properly manage, store and dispose of waste.

Impact 5: Waste management		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor	No burning of waste will be permitted.
Avoidance	Contractor	No burying of waste will be permitted.
Avoidance	Contractor	Handling, storage and disposal of hazardous waste must ensure not contamination and legal disposal results.
Avoidance	Contractor	An integrated waste management plan must be formulated that holistically manages all waste streams on site.

Impact 6: Terrestrial and aquatic ecological management

Description

- Comments from **Jacoline Mans**, Chief Forester, DAFF (**Table 8**); investigate the impacts on the riparian vegetation - employees can harvest indigenous plants for muthi, firewood and poach animals.

Uncertainties & limitations with predicting this impact

- None.

Assumptions made when assessing the impact

- None.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	3	3	4	3	30
With	2	2	3	2	14

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	2	Negative	L
With	1	Neutral	

Reference (legal, scientific, social or other criteria)

- Comments from **Jacoline Mans**, Chief Forester, DAFF

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- Dependent on the nature and extent of the impact.

Mitigations

Goal: To minimize the impacts on terrestrial & aquatic ecology.

Objective(s) (including targets):

- To have effective terrestrial and aquatic ecological management.

Impact 6: Terrestrial and aquatic ecological management		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Contractor	Do not harvest any of the vegetation.
Reduction	Contractor	Do not burn on areas where the fire can get caught by the vegetation.
Avoidance	Contractor	Do not poach animals

Impact 7: PV panels, inverter & substation.

Description

- Solar PV panels do not cause Acidification – The main gases that cause acidification through acid rain are sulphur dioxide and nitrogen oxides which are emitted mainly from coal based generation.
- Solar PV panels do not release Greenhouse Gas/Global Warming Emissions, contributing to climate change.
- Solar PV cells do not use water for generating electricity.
- The reflection of sunlight off the solar panels can be visibly intrusive in the natural environment.

Uncertainties & limitations with predicting this impact

- None.

Assumptions made when assessing the impact

- None.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	2	2	3	3	21
With	1	1	2	2	8

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	2	Negative	L
With	1	Neutral	

Reference (legal, scientific, social or other criteria)

- None

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- Dependent on the nature and extent of the impact.

Mitigations

Goal: To minimize the impact of the reflection of sunlight off the solar panels

Objective(s) (including targets):

- To minimize the impact of the reflection of sunlight off the solar panels

Impact 7: PV panels, inverter & substation.		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Applicant	Use non-reflective material for the PV panels (if possible)
Reduction	Applicant	Make use of a shield-like sheet to prevent direct exposure
Rectification	Applicant	Angle the panels in such a way that the reflection is minimized.

Decommissioning Phase

Impact 1: Disposal of PV panels and other waste

Description

- Improper disposal of PV panels can cause toxicity – the introduction of toxic or hazardous substances into the soil and a watercourse, i.e. acidification, the increased acidity of waterways through leeching (of acid forming substances) from improperly disposed PV panels.
- Improper disposal of PV panels can cause toxicity – the introduction of toxic or hazardous substances into an environment that may adversely affect the health of animals and people.
- Illegal dumping of solar PV panels will remove natural habitat.
- Illegal dumping of solar PV panels will result in the loss of certain land uses like agriculture and conservation.
- Excess waste puts a burden on existing landfill sites.
- Illegal dumping sites cannot retain the ecological functions and land use required to generate ecosystem goods and services and tangible economic benefits including income from conservation or farming.
- Waste contaminated areas and illegal dumps can be visibly intrusive in a natural landscape.

Uncertainties & limitations with predicting this impact

- None.

Assumptions made when assessing the impact

- Solar PV panels do not cause Acidification – The main gases that cause acidification through acid rain are sulphur dioxide and nitrogen oxides which are emitted mainly from coal based generation.
- Solar PV panels do not release Greenhouse Gas/Global Warming Emissions, contributing to climate change.
- Solar PV cells do not use water for generating electricity.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	2	2	3	2	14
With	1	1	2	2	8

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	2	Negative	L
With	1	Neutral	

Reference (legal, scientific, social or other criteria)

- None

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- Dependent on the nature and extent of the impact.

Mitigations

Goal: To minimize waste and ensure suitable disposal at the end of project life.

Objective(s) (including targets):

- Avoid improper waste disposal.

Impact 1: Disposal of PV panels and other waste		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Applicant	Properly dispose of waste.
Reduction	Applicant	Apply the "reuse, reduce, recycle" waste management model
Rectification	Applicant	Find out about means of proper special waste disposal sites from the municipality.

Impact 2: Human influence (staff conduct, movement)

Description

- Loud employees can cause a noise that is a nuisance.
- Improper sanitation at latrine sites can cause an odor.
- Litter can get washed into storm water drains and watercourses.
- Employees can harvest indigenous plants for muthi, firewood and poach animals.
- Littering can pose a risk of suffocation to wild animals (littering is likely to be more prevalent at designated eating/rest areas).
- Employees can burn fires to keep warm and runaway fires can destroy fauna and flora.
- Excessive sanitation at latrine sites can kill plants.
- Work related activities extending beyond the footprint - called construction creep - can disturb habitats.
- New employment opportunities and influx of workers could disrupt public transport.
- There may not be enough local accommodation.
- New (temporary) jobs for local residents will increase income and buying power within the local community.
- An increase demand for local accommodation will benefit small hotels.
- Employees can burn fires to keep warm and runaway fires can cause loss of livestock and property.
- Littering is visually intrusive.
- Comments from the Social Impact Assessment Report by Isle Dr Ilse Aucamp of Equispectives Research and Consulting Services - Negative community relations due to conduct of contractors/ representatives of Soventix. Creation of jobs and other economic opportunities. Establishment of infrastructure to generate renewable energy. Fire hazards (caused by people). For some stakeholders the sense of place will change.

Uncertainties & limitations with predicting this impact

- None.

Assumptions made when assessing the impact

- None.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	2	2	3	3	21
With	1	1	2	2	8

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	2	Neutral	M
With	1	Positive	

Reference (legal, scientific, social or other criteria)

- Social Impact Assessment Report by Isle Dr Ilse Aucamp of Equispectives Research and Consulting Services

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- Dependent on the nature and extent of the impact.

Mitigations

Goal: To avoid human induced environmental pollution, through waste & noise management and human behaviour.

Objective(s) (including targets):

- To maintain good housekeeping tendencies.

Impact 2: Human influence (staff conduct, movement)		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Employees	No dry wood, living plant or part thereof may be harvested from any plant community.
Reduction	Employees	No burning, including of waste for any reason.
Rectification	Employees	Follow housekeeping rules in order to avoid littering.

Impact 3: Degradation – Rehabilitation of affected footprints

The degradation of disturbed sites can result from erosion and plant replacement.

Description

- Rehabilitated sites can cause erosion and, if adjacent to or within a watercourse, sedimentation.
- If shaped or sloped incorrectly, such as when the rehabilitated areas are not returned to their original morphology, the resulting landscape can change surface water flow patterns.
- New growth on rehabilitated sites can be overgrazed by mammals.
- Rehabilitation that is not in accordance with the natural plant communities of the area can result in the introduction of non-indigenous plants.
- Disturbed areas, including those recently rehabilitated by the contractor are susceptible to weed, invader and alien plant¹ recruitment and the replacement of indigenous plant communities if not controlled.
- If shaped or sloped incorrectly, such as when the rehabilitated areas are not returned to their original morphology, the resulting landscape can change surface water flow patterns and so too plant communities, more so in arid environments.
- Reinstate ecological function by recreating an open system.
- Comments received from **Francois Taljaard**, Town Planner, Emthanjeni Municipality (**Table 8**); investigate rezoning of each site where development is to take place⁷⁻⁹ - the zoning associated with the operation of a solar PV plant may hinder the successful implementation of the original land use.
- Permanent employees will lose their employment.
- Disturbed sites will comprise mostly cleared/denuded areas that are vulnerable to degradation, including erosion, leading to a loss of biodiversity and ecosystem functions and processes.
- Rehabilitation can be expensive.
- The income generation or buying power of local residents employed during operation will return to 'normal'.
- All anthropogenic influences required during operation can be visibly intrusive in the natural landscape.

Uncertainties & limitations with predicting this impact

- The magnitude of the impact, specifically the extent and severity of the erosion and sedimentation, was not known.
- The magnitude of the impact, specifically the extent of alien plant invasion onto rehabilitated areas, was not known.

Assumptions made when assessing the impact

- Disturbed areas will degrade if left alone.

Assessment ((Extent + Magnitude+ Duration) x Probability = Significance):

Mitigation Action	Extent	Magnitude	Duration	Probability	Significance
Without	2	2	3	4	28
With	2	1	2	2	10

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

Mitigation Action	Social Acceptability	Status	Mitigation potential (to meet objectives)
Without	2	Negative	H
With	1	Neutral	

Reference (legal, scientific, social or other criteria)

1. The Principles of NEMA require that a proponent is responsible for any development s/he has initiated from the beginning to the end of the project ("From the cradle to the grave"). This responsibility is passed on from one title deed holder to the next. In line with this principle a rehabilitation plan has got to be drawn up to specify how the area will be rehabilitated once the project has ceased for whatever reason.
2. Conservation of Agriculture Resources Act (Act 43 of 1983) as amended, and administered by the DALA, including the following:
 1. Section 15A(1) of CARA, 1983, as amended: Category 1 plants may not occur on any land or inland water surface other than in biological control reserves.
 2. Section 15A(2) of CARA, 1983, as amended: A land user shall control any category 1 plants that occur on any land or inland water surface in contravention of the provisions of sub-regulation (1) by means of the methods prescribed in regulation 15E.
 3. Section 15B(1) of CARA, 1983, as amended: Category 2 plants may not occur on any land or inland water surface other than a demarcated area or a biological control reserve.
 4. Section 15B(8) of CARA, 1983, as amended: A land user shall control any category 2 plants that occur on any land or inland water surface in contravention of the provisions of sub-regulation (1) by means of the methods prescribed in regulation 15E.
 5. Section 15C(1) of CARA, 1983, as amended: Category 3 plants shall not occur on any land or inland water surface other than in a biological control reserve.
 6. Section 15C(3)(a) of CARA, 1983, as amended: No land user shall allow category 3 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland.
 7. Northern Cape Planning and Development Act, 1998.
 8. Emthanjeni Local Municipality, Integrated Development Plan (IDP), 2016/2021
 9. Emthanjeni Municipality, Spatial Planning & Land Use, Management By-law, Northern Cape Province, GN No. 192 of 2015, Provincial Gazettes (Northern Cape), No. 1979 of 14th December, 2015. Spatial Planning & Land Use Mgt Act No. 16 of 2013 (came into force on 01st July 2015).

Impact reversibility/The degree to which the impact may cause an irreplaceable loss of resources

- Disturbed areas can be rehabilitated. The cost thereof will depend on the severity and extent of the degradation.
- The extent of reversibility is dependent on the severity of the erosion, including the nature of the remaining *in situ* material, the amount of soil that has been exported from a site and whether or not the exported soil is recoverable. For example, soil washed from a gravel road into a mitre drain can be graded back onto the surface of the road, whereas soil that is washed from a gully into a water course is not recoverable and the source cannot be reinstated without significant intervention and cost. Although erosion has the potential to irreversibly change the relief, eroded sites can be stabilized through rehabilitation measures.
- If controlled timeously the impact of alien plant species can be negligible. However, if allowed to grow unabated, alien invasive species can replace entire plant communities with homogeneous stands. Biodiversity is significantly reduced and ecosystem function is altered. In the later case, rehabilitation will require significant intervention and cost.

Mitigations

Goal:

Facilitate the natural rehabilitation of disturbed areas and control the replacement of indigenous vegetation by weed, invader and exotic plant species.

Objective(s) (including targets):

- To avoid long-term degradation.
- To reduce erosion of and rehabilitated access roads and the satellite camp.
- To prevent the maturation and reproduction of weed, invader and exotic plant species from occurring on any land that is rehabilitated after construction.

Impact 3: Degradation – Rehabilitation of affected footprints		
Type of mitigation	Responsible authority	Mitigation
Avoidance	Applicant	Reinstate the original land use - rezoning
Reduction	Applicant	Applicant shall monitor the rehabilitated plant servitudes for signs of erosion.
Rectification	Applicant	If erosion is found to occur during the aforesaid monitoring, the Applicant shall immediately correct (the 'source') and repair (the 'symptom') the erosion using method(s) that are an improvement on the mitigations proposed in the EMPr or on the unsuccessful mitigations originally used on site.
Reduction	Applicant	The rehabilitated plant servitudes shall be monitored following the completion of the construction of the Solar PV plant for the recruitment of weed, invader and alien plant species.
Rectification	Applicant	Applicant shall immediately uproot, cut or debark weed, invader

		and alien plant species upon being identified.
Rectification	Applicant	Applicant shall collect and destroy all seeds of weed, invader and alien plant species occurring within disturbed and/or rehabilitated areas.

Cumulative Impact Assessment: $Assessment ((Extent + Magnitude + Duration) \times Probability = Significance):$

Potential to mitigate:

High – High potential to mitigate and achieve objectives.

Moderate – Moderate potential to mitigate, and achieve objectives.

Low – There is a potential to mitigate, but there remains a risk of the objectives not being met.

High Significance: 30 - 40	Medium Significance: 20 - 29	Low Significance: 1 - 19
----------------------------	------------------------------	--------------------------

<u>IMPACT</u>	<u>SIGNIFICANCE WITHOUT MITIGATION</u>	<u>SIGNIFICANCE WITH MITIGATION</u>	<u>POTENTIAL TO MITIGATE</u>
Planning and Design			
Potential Offences	36	0	High
Sustainable resource requirements (water, energy, etc.) for lifespan of project	27	6	High
Rezoning	33	14	Moderate
Layout and design including consideration of alternatives	30	12	High
Socio-economic	21	8	Moderate
Construction Phase			
Pollution of air (quality) directly through the generation of light, dust, noise and emissions	21	10	High
Pollution (quality) of soil and surface water directly through contamination by construction activities and sedimentation	18	10	High
Loss of surface and ground water (quantity) directly through construction activities	15	10	High
Loss of soil/rock (quantity) directly from erosion, sand mining, contamination and mixing	28	10	High
Loss/gain of terrestrial animals including mammals directly through clearing, smothering, poaching, colliding, trampling, excavation, and littering	15	5	High
Replacement of terrestrial plants directly through the recruitment of alien and/or invasive plant species	28	10	High
Loss/gain of terrestrial plants directly through the clearing, smothering, trampling, and harvesting of plants	18	10	High
Loss/gain of aquatic plants	12	4	Moderate
Loss/gain of aquatic habitat	16	4	Moderate
Loss/gain of terrestrial habitat	40	21	Moderate
Transformation and fragmentation	40	21	Moderate

of terrestrial habitat			
Socio-economic	14	12	High
Cultural	14	12	High
Degradation – Site closure and rehabilitation	21	10	High
Operational Phase			
Human influence (staff conduct and movement)	30	12	High
Consumption (energy, water, and other resources)	27	12	High
Maintenance	24	8	High
Lighting to create visibility at night	14	4	High
Waste management	24	10	High
Terrestrial and aquatic ecological management	30	14	Low
PV panels, inverter & substation.	21	8	Low
Decommissioning Phase			
Disposal of PV panels and other waste	14	8	Low
Human influence (staff conduct, movement)	21	8	Moderate
Degradation – Rehabilitation of affected footprints	28	10	High

Conclusion:

From the above table it can be concluded that the accumulative impacts have a high potential to be mitigated.