ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)

DFFE Reference Number:
14/12/16/3/3/2/998

Project Title:
The proposed development of a 300MW solar photovoltaic (PV) facility on Portion 1 of Farm Riet Fountain 39C, Portion 1 of Kwanselaars Hoek 40C and Portion 4 of Taaibosch Fontein 41C in the Hanover district, Emthanjeni local municipality, Pixley Ka Seme district municipality; Northern Cape province.

Prepared for:

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DOCUMENT CONTROL

Table 1: Document Control.

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Justin Bowers	Draft	00		01 August 2017
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Justin Bowers	Amendment	Final 00		12 April 2021
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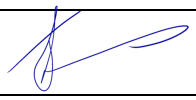
Justin Bowers	Amendment 2	Final 00		05 August 2022

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (MSc., Pr.Sci.Nat.)
Reg: 2006/023163/23

EXECUTIVE SUMMARY

Soventix South Africa proposes to establish a commercial solar electricity generating facility between the towns of De Aar & Hanover in the Northern Cape province. The solar facility intends to accommodate photovoltaic (PV) components and associated infrastructure comprising of:

- Solar panels arranged in blocks with a total generating capacity of approximately 300 MW_{AC} to be constructed as three separate yet integrated facilities of 100MW_{AC} each. A total footprint of approximately 170 ha is normally required per 100MW_{AC} facility, totalling approximately 510 ha, but the developer has managed to design the facility to fit comfortably within a 448 ha footprint.
- Each 100 MW_{AC} facility will have an operations building to be contained within a 30 000 m² lay down area for each facility. The facility will include areas used for security management and control room, maintenance as well as changing facilities.
- On-site substations (132Kv switching yard and MTS) with the necessary infrastructure to feed the electricity generated from solar PV facilities, via a loop in loop out into the immediately adjacent 400 kV Eskom network. The MTS will be increased from 300MW to 1GW. Impacts and mitigations governing the substations and associated distribution (power) lines are managed by the Generic EMPr appended to the main EMPr.
- Containerised battery storage and dual-fuel (diesel and Liquefied Natural Gas (LNG)) backup generation with associated fuel storage. This will require 500MWh of Lithium-Ion battery storage, equating to sixty-six (66) forty-foot (40') containers. Each shipping container is 12.2(l) x 2.43(w) x 2.59(h) in dimensions, with a collective/total footprint of approximately 2000m^2. Additionally, nine (9) generator units (1kW each) will be required to generate <10MW of backup electricity. Above-ground fuel storage will be required of less than 80m^3 to provide the generators with fuel.
- Development of a "staging area" where large transport vehicles can offload infrastructure and equipment for transfer onto smaller vehicles for localised distribution to site. The staging area will also act as an access control point, for staff and contractor's entering and exiting the PV sites.
- Inclusion of an existing access road across a watercourse, as the main access to the Phase 1 facility, in addition to the current property owner's main access road.

This Environmental Management Programme (EMPr) is developed in compliance with section 24N of the NEMA, 1998, as amended and contains those requirements prescribed in the EIA Regulations, 2014, including regulation 23, 32 and Appendix 4 of GN No. R. 326 of 7 April 2017, as amended.

The EMPr is to be read in conjunction with the EIA Report (EIAr) providing detail on the affected environment as well as an impact assessment for the anticipated environmental impacts and the Environmental Authorisation (EA) (once issued).

The developers propose to establish the project on the approved footprint which affects 3 properties namely, Portion 1 of Farm Riet Fountain 39C, Portion 1 of Kwanselaars Hoek 40 C &

Portion 4 of Taaibosch Fontein 41C, registration district Hanover, Emthanjeni Local Municipality, Pixley Ka Seme District Municipality; Northern Cape Province.

Activities to be undertaken during the construction, operational and decommissioning phases include:

Construction Phase

- Site preparation;
  - Clearly delineate the construction footprint to avoid construction creep outside the approved development footprint,
  - Search & rescue fauna & flora of conservation concern & protected status ahead of any construction activities,
- Installation of perimeter fencing, during but preferably prior to construction commencement (improved access control and assurance of no construction creep);
- Upgrade existing roads and establish service tracks;
- Transport components and equipment to site;
- Establish "Staging Area" for large vehicle and equipment offloading and access control;
- Establishment of laydown areas;
- Establishment of ancillary infrastructure;
  - Installation of containerised lithium-ion battery storage;
  - Installation of containerised dual-fuel (diesel & LNG) backup generators;
  - Installation of above-ground fuel storage with a combined capacity of <80m^3;
- Construction of infrastructure foundations;
- Establishment of PV panels;
- Connection of PV panels to the on-site substations;
- Connection of on-site substations to the grid;
- Site rehabilitation; and
- Environmental management & monitoring throughout the construction process, inclusive of;
  - Continuous monitoring and removal of alien & invasive plant species,
  - Avifauna monitoring and management,
  - Traffic monitoring & management, including dust emissions,
  - Dust monitoring & management, including drilling operations,
  - Storm water monitoring & management,
  - Erosion monitoring and remediation,
  - Fire management,
  - Vegetation & habitat monitoring & management,
  - Hazardous substance monitoring & management, including detecting any leakage or spillage, and
  - Monitoring & management measures to protect hydrological features.

Operational Phase

- Maintenance and repairs of PV and associated equipment inclusive of;

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  - Maintenance of roads,
  - Cleaning and maintaining / replacing panels,
  - Maintaining buildings and other infrastructure, and
  - Maintain and repair fencing.
- Environmental management & monitoring throughout the operational process, inclusive of;
  - Continuous monitoring and removal of alien & invasive plant species,
  - Avifauna monitoring and management,
  - Storm water monitoring & management,
  - Erosion monitoring and remediation,
  - Fire management,
  - Vegetation & habitat monitoring & management,
  - Monitoring & management measures to protect hydrological features.
- Waste management; and
- Health and safety implementations.

Post Operational Phase

Two options currently exist for this phase: 1. Should an extension not be granted on the power purchase agreement (PPA), the equipment and infrastructure will be removed and recycled. The site will be fully rehabilitated thereafter. 2. If an extension is granted to the power purchase agreement, consideration would be given to infrastructure upgrade and the deploying of more advance technologies.

1. Decommissioning

Complete decommissioning can occur should it no longer be economically feasible to continue the project or the PPA is not extended. Activities will include:

- Site reparation,
- Disassembly and recycling of existing components, and
- Rehabilitation of the site.

OR:

2. Extension of tenure

Replacement of panels that reached the end of their economic life or replacement with new technology. Activities include:

- Disassembly and replacement of individual panels,
- Repair, maintenance and / or replacement of the framework structures and other required infrastructure, and
- Recycling / disposing of replaced parts.

The implementation of the EMPr within the project is not an optional additional or “add on” requirement. The EMPr is legally binding, integral to the contract and is as important as the engineering aspects of the contract. The EMPr is a working document to be used throughout the life of the project, until such time that closure is achieved.

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CHECKLIST

An environmental management programme (EMPr) must comply with section 24N of the NEMA, 1998, as amended and contain those requirements prescribed in the EIA Regulations, 2014, as amended, including regulation 23, 32 and Appendix 4. Additional requirements relating to content of the EMPr were specified in the departmental communication dated 29/05/2017 as part of the approval of the final Scoping Report as well as department correspondence dated 05/09/2017 as part of the approval of the Draft Environmental Impact Assessment report, as well as departmental comments received on the Part 2 amendment report (dated 24/03/2001) which too have been included. The full suite of requirements are listed in Table 2, which have dictated the layout and content of this EMPr.

Table 2: Environmental Management Programme Checklist.

Content of Environmental Management Programme (EMPr)	Checked
1. (1) An EMPr must comply with section 24N of the Act and include-	☑
(a) details of	☑
(i) the EAP who prepared the EMPr; and	☑
(ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae;	☑
(b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	☑
(c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;	☑
(d) a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including-	☑
(i) planning and design;	☑
(ii) pre-construction activities;	☑
(iii) construction activities;	☑
(iv) rehabilitation of the environment after construction and where applicable post closure; and	☑
(v) where relevant, operation activities;	☑
(f) a description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to -	☑
(i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;	☑

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(ii) comply with any prescribed environmental management standards or practices;	☑
(iii) comply with any applicable provisions of the Act regarding closure, where applicable; and	N/A
(iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;	N/A
(g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	☑
(h) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	☑
(i) an indication of the persons who will be responsible for the implementation of the impact management actions;	☑
(j) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	☑
(k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	☑
(l) a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;	☑
(m) an environmental awareness plan describing the manner in which-	☑
(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and	☑
(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and	☑
(n) any specific information that may be required by the competent authority.	☑
(2) Where a government notice gazetted by the Minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply.	N/A
The Environmental Management Programme (EMPr) to be submitted as part of the EIAr must include the following (as per departmental communication dated 29/05/2017 & 05/09/2017 as part of the approval of the final Scoping Report & Draft EIAr, respectively):	☑
i. All recommendations and mitigation measures recorded in the EIAr and the specialist studies conducted.	☑
ii. The final site layout map.	☑
iii. Measures as dictated by the final site layout map and micro-siting.	☑
iv. An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.	☑
v. A map combining the final layout map superimposed (overlain) on the environmental sensitivity map.	☑
vi. An alien invasive management plan to be implemented during construction and operation of the facility. The plan must include mitigation measures to reduce the	☑

invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken.	**APPENDIX 1**
vii. A plant rescue and protection plan which allows for the maximum transplant of conservation important species from areas to be transformed. This plan must be compiled by a vegetation specialist familiar with the site and be implemented prior to commencement of the construction phase.	☑ **APPENDIX 2**
viii. An avifauna monitoring and management plan to be implemented during construction and operation of the facility. This plan must be drafted by a suitably qualified avifauna specialist.	☑ **APPENDIX 3**
ix. A re-vegetation and habitat rehabilitation plan to be implemented during construction and operation of the facility. Restoration must be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.	☑ **APPENDIX 4**
x. An open space management plan to be implemented during the construction and operation of the facility.	☑ Intrinsic in EMPr conditions.
xi. A traffic management plan for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimize impacts on local commuters e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations.	☑ **APPENDIX 5**
xii. A storm water management plan to be implemented during the construction and operation of the facility. The plan must ensure compliance with the applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan must include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of storm water run-off.	☑ **APPENDIX 8**
xiii. A fire management plan to be implemented during the construction and operation of the facility.	☑ **APPENDIX 7**
xiv. An erosion management plan for monitoring and rehabilitation erosion events associated with the facility. Appropriate erosion mitigation must form part of this plan to prevent and reduce the risk of any potential erosion.	☑ **APPENDIX 6**
xv. An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids entering the soil or storm water systems.	☑

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xvi. Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants.	☑
The EAP must provide detailed motivation if any of the above requirements is not required by the proposed development and not included in the EMPr.	☑
The draft EMPr to be submitted with the final amendment report must be updated to include and incorporate all mitigation measures recommended by the specialists as well as the relevant commenting authorities (as per departmental communication dated 24/03/2021):	☑ Included in updated EMPr conditions.
It has been noted that as part of the mitigation measures to be included in the EMPr, on page 30 of the motivation report states "the gas turbine generation capacity may not exceed 10MW". In addition, it has been mentioned that the containers are likely to be installed on plinths above ground to minimise impacts on stormwater runoff. You are advised to refrain from using the words such as "may and likely".	☑ Firm commitment made to the installation of plinths.

ABBREVIATIONS / ACRONYMS AND DEFINITIONS

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

Abbreviation / Acronym	Term
BA	Basic Assessment as provided for in NEMA (Act 107 of 1998) and EIA Regulations (2014), as amended.
CA	Competent Authority
CAR	Corrective Action Reports
CLO	Community Liaison Officer
CRE	Chief Resident Engineer
DEA	Department of Environmental Affairs (National)
DENC	Department of Environment and Nature Conservation (Northern Cape)
DMR	Department of Mineral Resources
DWS	Department of Water & Sanitation
EA	Environmental Authorisation
EAPASA	Environmental Assessment Practitioners Association of South Africa
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment as provided for in NEMA (Act 107 of 1998) and EIA Regulations (2014), as amended.
EIAr	Environmental Impact Assessment Report
EMPr	Environmental Management Programme
ELM	Emthanjeni Local Municipality
ELU	Existing Lawful Use as per Part 3 of the National Water Act (Act 36 of 1998)
EM	Environmental Manager
IEA	Independent Environmental Auditor
GA	General Authorisation as per Section 39 of the National Water Act (Act 36 of 1998)
HSO	Health & Safety Officer
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
LA	Listed Activity (EIA Regulations, 2014)
LN1	Listing Notice 1: GN. No. R. 983, 4 December 2014, as amended in GN. No. R. 327, 7 April 2017.
LN2	Listing Notice 2: GN R. 984, 4 December 2014, as amended in GN. No. R. 325, 7 April 2017.

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LN3	Listing Notice 3: GN R. 985, 4 December 2014, as amended in GN. No. R. 324, 7 April 2017.
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NWA	National Water Act, 1998 (Act No. 36 of 1998)
PDM	Pixley ka Seme District Municipality
PPA	Power Purchase Agreement
REFIT	Renewable Energy Feed-in Tariff
SACNASP	South African Council for Natural Scientific Professions
SAHRA	South African Heritage Resources Agency
SDF	Spatial Development Framework
SEO	Site Environmental Officer
SO	Social Officer
WUL	Water Use License

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

Term	Source	Definition
Aspect (environmental)	ISO 14001: 2015	Element of an organisation's activities or products or services that interacts or can interact with the environment. An environmental aspect can cause (an) environmental impact(s). A significant environmental aspect is one that has or can have one or more significant environmental impact(s).
Corrective Action	ISO 14001: 2015	Action to eliminate the cause of a non-conformity (or non-compliance in the case of an EMPr) and prevent recurrence.
Development	EIA Regulations (2014)	Means the building, erection, construction or establishment of a facility, structure or infrastructure, including associated earthworks or

		borrow pits, that is necessary for the undertaking of a listed or specified activity, but excludes any modification, alteration or expansion of such a facility, structure or infrastructure, including associated earthworks or borrow pits, and excluding the redevelopment of the same facility in the same location, with the same capacity and footprint.
Environmental Impact	ISO 14001: 2015	Change to the environment, whether adverse or beneficial, wholly or partially resulting an organisation's environmental aspects.
Maintenance	EIA Regulations (2014)	Means actions performed to keep a structure or system functioning or in service on the same location, capacity and footprint.
Performance	ISO 14001: 2015	Measurable unit. Performance can relate either to quantitative or qualitative findings.
Significant impact	EIA Regulations (2014)	Means an impact that may have a notable effect on one or more aspects of the environment or may result in non-compliance with accepted environmental quality standards, thresholds or targets and is determined through rating the positive and negative effects of an impact on the environment based on criteria such as duration, magnitude, intensity and probability of occurrence.

SECTION 1: DETAILS & EXPERTISE OF THE EAP AND APPLICANT

Details of –

(i) The EAP who prepared the report;

Environmental Assessment Practitioner	Ecoleges Environmental Consultants
Contact Person	Justin Aragon Bowers
Postal Address	PO Box 9005, Nelspruit, 1200
Telephone	+27(0)83 644 7179
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Project Applicant	Soventix South Africa (Pty) Ltd
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(i) The expertise of the EAP to prepare the EMPr, including a curriculum vitae;

Abbreviated Curriculum Vitae of Justin Aragon Bowers

Name	Justin Bowers
Date of birth / ID No.	15 October 1972 7210155074089
Nationality	South African
Marital Status	Married with four children
Current Address	P O Box 516, Machadodorp, 1170. ● Redwing Farm, erf. Kaalbooi 368JT, Waterval Boven District, 1195, Mpumalanga, South Africa ● Cell: 082 451-5608 ● e-mail: justin@ecoleges.co.za
Languages	English, Afrikaans and Basic Zulu
Driver's Licence	Code EB, A & C1
Specialisations	Key Fields: Compliance monitoring, vegetation ecology, rehabilitation plans, environmental / ecological management plans, environmental auditing, Environmental Impact & Basic Assessment.
Qualifications & Courses Attended	**1998 – 2000** NATIONAL DIPLOMA: NATURE CONSERVATION, Technikon Pretoria **2001 – 2002** BACCALAUREUS TECHNOLOGIAE: NATURE CONSERVATION, Technikon Pretoria **2003 – 2007** MAGISTER TECHNOLOGIAE: NATURE CONSERVATION (CUM LAUDE), Tshwane University of Technology, Pretoria **2008** Environmental Law elective (MBA Programme), Rhodes University, Grahamstown. **2010** Certificate in Aquaculture, Department of Genetics & Aquaculture, University of Stellenbosch **2014** Implementing Environmental Management Systems, Centre for Environmental Management, North-West University, Potchefstroom. **2017** Transition ISO 14001 course, Centre for Environmental Management, North-West University, Pretoria locale. **2018** Lead Auditor's Course, Centre for Environmental Management, North-West University, Potchefstroom. **2020** Weed Control Course, Pest Control Industries Training Academy, Centurion, Pretoria.
Professional affiliations	IAIA^{sa}, GSSA, SACNASP.

SECTION 2: INTRODUCTION & BACKGROUND

Photovoltaic (PV) is a method of generating electrical power by converting solar radiation into direct current electricity. A number of solar cells electrically connected to each other and mounted in a support structure or frame is called a photovoltaic module (solar panel). The facility will include areas used for management, security and control room, maintenance and canteen as well as changing facilities. On-site substations will be required with the necessary infrastructure to feed the electricity generated, via a loop-in, loop-out, into the immediately adjacent 400kv Eskom network.

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

This EMPr originally formed part of the feasibility study and prerequisite by the National Energy Regulator of South Africa (NERSA) for awarding a Power Purchase Agreement (PPA) under the Renewable Energy Feed in-Tariff (REFIT) program. However, Soventix SA has now obtained a Cost Estimate Letter (CEL) from Eskom for an increase in the interconnection of embedded generation grid access, from renewable energy to Eskom infrastructure. This increased capacity of the on-site sub-station will facilitate additional generation capacity into the Eskom grid for “wheeling” to private consumers, from the authorised Phase 1 project as well as potential from the Phase 2 & 3 projects as well as other local renewable energy projects requiring grid access.

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

SECTION 3: DESCRIPTION OF THE ACTIVITY

(b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description.

Table 5 describes all of the activities that will be undertaken during the lifespan of this project including the identified listed activities 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:
Expansion and repositioning of a substation, addition of a switching yard sub-station, additional access road from a proposed staging area (offloading and access control area) to the development of a 300MW solar photo-voltaic (PV) facility, comprising 3 interconnected 100MW plants, that ties into existing overhead ESKOM 400kV transmission lines, and associated infrastructure including containerised lithium-ion battery storage and dual-fuel backup generators and associated fuel storage, on several portions of farms in the Hanover District, Emthanjeni Local Municipality, Pixley Ka Seme District Municipality, Northern Cape Province.

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Table 5. A detailed description of the activities (including Listed Activities as per the EIA Regulations, 2014 as amended) and resultant aspects of the project that are covered by the EMPr.

Phase	Activity	Sub-activities	Aspects
Planning & Design (including pre-construction)	Compliance with legal requirements by acquiring authorisations, permits and/or licenses for activities/uses undertaken during construction and operation	Protected Species	Impacting protected species prior to obtaining the required licenses / permits.
		Water Use (Section 21(c&i) of the National Water Act (Act 36 of 1998))	Impacting the watercourse prior to obtaining the required licences / permits.
		Water Use (Section 21(g) of the National Water Act (Act 36 of 1998))	Impacting a water resource through disposal of waste prior to obtaining the required licences / permits.
		Water Use (Section 21(a) of the National Water Act (Act 36 of 1998))	Taking water from a watercourse prior to obtaining the required licences / permits.
		Borrow pits	Mining sand prior to obtaining the required licences / permits.
		Access Roads	Poor alignment & extent of linear activities like roads, fences, pipelines or other cleared servitudes can increase runoff, cause erosion and sedimentation of aquatic habitats and result in regulatory non-compliance. Access roads crossing Eskom servitude.
		Servitudes & wayleaves	Commencement without authorisation / permit from relevant authorities. Eskom setback requirements & guidelines.
		Compliance monitoring	Commencement without appointment of an Environmental Control Officer (ECO) to monitor compliance with the EA & EMPr.
		Municipal bylaws	Non-compliance with the municipal bylaws.

Phase	Activity	Sub-activities	Aspects
		Protection of archaeological findings	Destruction of graves and other sites of archaeological value and need for relevant permits where necessary.
		Water use (Section 21(e) of the National Water Act (Act 36 of 1998))	Reuse of treated effluent
	Socio-economic considerations	Employment of local labour	Insufficient employment of local labour.
			Presence of construction workforce.
			Influx of job seekers.
			Loss of farm labour to construction work.
			Job seekers may begin enquiring prior to commencement of construction as awareness of the project grows.
		Economic benefits from professionals	If the professionals are unreasonably expensive, the funds to head the projects might be exhausted.
		Expectations (SIA)	Job seekers may begin enquiring prior to commencement of construction as awareness of the project grows.
		Uncertainty (SIA)	Community confusion, frustration & lack of information.
	Rezoning and landuse **Listed Activity 28 of GN 983, as amended *Residential, mixed, retail, commercial, industrial or institutional developments where such land was used***	Land Acquisition and Access to Site	Physical and economic displacement of households / individuals. Approval for leasing of agricultural land under Act 70 of 1970.

Phase	Activity	Sub-activities	Aspects
	for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development: *(i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or* ***(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.***		
	Layout and design	Provision of maintenance and workshop areas	Dust generation.
			Loss of vegetation, habitat and soil fertility.
			Soil contamination.
			Water Contamination.
		Construction and use of Temporary Access Roads	Dust generation.
			Loss of Vegetation, Habitat and soil fertility.
			Increased potential for erosion.

Phase	Activity	Sub-activities	Aspects
			Increase in vehicle movement in area.
		Provision of sanitation systems	Dust generation.
			Loss of vegetation, habitat and soil fertility.
			Ground water contamination.
		Bund area for fuel storage	Dust generation.
			Loss of vegetation, habitat and soil fertility.
			Soil contamination.
		Demarcation, fencing and gates	Loss of vegetation and habitat.
			Impede faunal movement.
			Impeded human movement and disrupted daily activities.
		Vegetation Clearing & Soil Hardening	Loss of vegetation, habitat and soil fertility.
		Working near or on the watercourse	Decline in water availability of water resource.
		Water Use, abstraction and Management	
		Mining of sand	Dust generation.
			Loss of vegetation, habitat and soil fertility.
			Increased potential for erosion.
			Soil contamination.
			Encroachment and establishment of alien vegetation.
			Water contamination.
			Decline in aesthetic quality of the environment.
			Increased safety risks.

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Phase	Activity	Sub-activities	Aspects
		Staging Area	Provision of Staging Area for offloading and access control
	Readiness	Awarding of preferred bidder	Socio-economic benefits
Construction	Site establishment (construction camp, sanitation, temporary accommodation)	Clear & grub (fence line, operations area, access roads, rack foundations, transformers and inverters, cables, substations and pylons)	Dust generation.
			Loss of vegetation, habitat and soil fertility.
			Noise Generation.
		Construction and use of Temporary Access Roads	Loss of Vegetation, Habitat and soil fertility.
			Increased potential for erosion.
			Increased level of noise generation.
			Increase in vehicle movement in area.
			Dust generation.
		Sanitation	Dust generation.
			Loss of vegetation, habitat and soil fertility.
			Ground water contamination.
			Adequate provision of ablutions and shower facilities
			Low emission sanitation technology
		Fencing & gates	Loss of vegetation and habitat.
			Impede faunal movement.
			Impeded human movement and disrupted daily activities.
		Lighting	Visual intrusion in remote areas.
	Access control including fencing of perimeter	Construction and use of Temporary Access Roads	Loss of Vegetation, habitat and soil fertility.
			Increased potential for erosion.
			Increased level of noise generation.
			Increase in vehicle movement in area.

Phase	Activity	Sub-activities	Aspects
			Dust generation.
		Fencing & gates	Loss of vegetation and habitat.
			Impede faunal movement
			Impeded human movement and disrupted daily activities.
	Contractor's employees (staff conduct, movement)	Water use and management	Water contamination.
			Misuse of available water.
		Cooking of food	Harvesting & fire control.
		Sanitation	Unpleasant odours.
			Mismanagement of sewerage.
		Employment of local labour	Insufficient employment of local labour.
			Presence of construction workforce.
			Influx of job seekers.
			Loss of farm labour to construction work.
	Construction/upgrading of permanent & temporary access roads	Vegetation Clearing & Soil Hardening	Dust generation.
			Loss of vegetation, habitat and soil fertility.
			Increased level of noise generation.
		Impact on the existing road conditions	The development of potholes.
			Damage to vehicles.
			Potential increase in vehicle accidents.
		Upgrade of access road across watercourses	Potential influence on hydrology, water quality & aquatic biota
		Parking	Increase in vehicle movement in area.
			Impact on the existing road conditions.

Phase	Activity	Sub-activities	Aspects
	Transport on site & accommodation of traffic (parking areas)		Increase human safety risk.
			Increase in the level of noise generation.
			Greenhouse gas emissions.
		Impact on the existing road conditions	The development of potholes.
			Damage to vehicles.
			Potential increase in vehicle accidents.
	Sourcing & management of water (for drinking, sanitation & construction activities)	Drinking, dust suppression & sanitation	Water contamination.
			Misuse of available water.
	Sourcing & management of building material / sand	Excavation of suitable bedding and backfill material	Dust generation.
			Loss of vegetation, habitat and soil fertility.
			Increased potential for erosion.
		Topsoil stripping and storage	Dust generation.
			Loss of vegetation, habitat and soil fertility.
			Increased potential for erosion.
			Soil contamination.
			Encroachment and establishment of alien vegetation.
		Slopes and slope stabilisation	Dust generation.
			Increased potential for erosion.
			Water contamination.
			Decline in aesthetic quality of the environment.
			Increase human safety risk.

Phase	Activity	Sub-activities	Aspects
	Stockpiling and material laydown areas (spoil, mulch, building sand, topsoil, windrows, material & equipment)	Topsoil stripping storage	Dust generation.
			Loss of vegetation, habitat and soil fertility.
			Increased potential for erosion.
			Soil contamination.
			Encroachment and establishment of alien vegetation.
			Reduced productivity of subsistence farmland.
		Slopes and slope stabilisation	Dust generation.
			Increased potential for erosion.
			Water contamination.
			Decline in the aesthetic quality of the environment.
			Increase human safety risk.
	Earthworks & excavations (associated with the operations area, road crossings, cabling, transformers and inverters, substations and pylons) **Listed Activity 19 of GN. No. 983, as amended**	Cut and Fill	Dust generation.
			Increased potential for erosion.
		Trenching	Dust generation.
			Increased potential for erosion.
			Increase human safety risk.
		Importing of suitable bedding and backfill material	Dust generation.
			Loss of vegetation, habitat and soil fertility.
			Reduced productivity of subsistence farmland.
			Increased potential for erosion.
		Topsoil stripping and storage	Dust generation.
			Loss of vegetation, habitat and soil fertility.
			Increased potential for erosion.

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Phase	Activity	Sub-activities	Aspects
	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse; *but excluding where such infilling, depositing, dredging, excavation, removal or moving- (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan;*		Soil contamination.
			Reduced productivity of subsistence farmland.
			Encroachment and establishment of alien vegetation.
		Slopes and slope stabilisation	Dust generation.
			Increased potential for erosion.
			Water contamination.
			Decline in aesthetic quality of the environment.
			Increase human safety risk.
		Crushing of material	Dust generation.
			Loss of vegetation, habitat and soil fertility.

Phase	Activity	Sub-activities	Aspects
	(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies. *(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or* *(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.*		
	Drilling and/or Ram piling (associated with the rack foundations for the panel mounting hardware and fence poles)	Installation of warning signage	Decrease in aesthetic quality of the environment.
			Lack of visibility of signage.
		Crusher Plant	Dust generation.
			Loss of vegetation, habitat and soil fertility.
		Use of generators	Increase in level of noise generation.

Phase	Activity	Sub-activities	Aspects
			Soil contamination.
	Erection and construction of the panels arrays and associated infrastructure **Listed Activity 1 of GN. No. 984, as amended** ***The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more,*** *excluding where such development of facilities or infrastructure is for photovoltaic*	Spoil material generation and management	Dust generation.
			Loss of vegetation, habitat and soil fertility.
			Decline in the aesthetic quality of the environment.
		Transportation and storage of the panel arrays and associated materials	Increase in vehicle movement in area.
			Impact on the existing road conditions.
			Increase human safety risk.
			Increase in the level of noise generation.
			Greenhouse gas emissions.
		Protection of archaeological findings	Destruction of graves and other sites of archaeological value.

Phase	Activity	Sub-activities	Aspects
	installations and occurs- *(a) within an urban area; or* *(b) on existing infrastructure.* The solar PV installation will be a total of 300MW outside an urban area, on a green fields site.		
	Feeding or tying the solar PV plant into existing Eskom grid. **Listed Activity 9 of GN. No. 984, as amended** **The development of facilities or infrastructure for the transmission and distribution of**	Relocation of existing services	Disruption in the provision of services.
		Consultation with affected parties	Insufficient consultation.
		Working near or under powerlines	Damage and inaccessibility to powerlines.
		Working in the watercourse	Impeding and/or diverting water in the watercourse.

Phase	Activity	Sub-activities	Aspects
	electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial complex excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is — (a) temporarily required to allow for maintenance of existing infrastructure; (b) 2 kilometres or shorter in length; (c) within an existing transmission line servitude; and (d) will be removed within 18 months of the commencement of development.		

Phase	Activity	Sub-activities	Aspects
	The overhead Eskom lines are 400kva and the loop-in, loop-out from the sub-station to the Eskom overhead lines may exceed 2 kilometres in length, depending on which of the two 400kva Eskom designates for the tie-in.		
	Handling of waste & generation (solid waste including 'spoil', liquid waste, separation, storage and disposal)	Domestic and construction waste collection, storage, handling and disposal	Unpleasant odours.
			Increase in waste generation.
			Decline in the aesthetic quality of the environment.
		Spoil material generation and management	Dust generation.
			Loss of vegetation, habitat and soil fertility.
			Decline in the aesthetic quality of the environment.
	Handling of hazardous substances (fuel/oil, cement, bitumen, sewage/grey water) & management (including	Maintenance of sanitation systems	Unpleasant odours.
			Soil contamination.
			Water contamination.
			Mismanagement of sewerage.
		Bund area for fuel storage	Dust generation.

Phase	Activity	Sub-activities	Aspects
	storage) at sanitation sites, kitchens, batching sites, workshops, washbays, refuelling areas and on site.		Loss of vegetation, habitat and soil fertility.
			Soil contamination.
		Provision of oil sump and separators for construction plant wash bays, refuelling and workshop areas.	Dust generation.
			Loss of vegetation, habitat and soil fertility.
			Soil contamination.
			Water Contamination.
		Use of flammable material and other material stores	Dust generation.
			Loss of vegetation, habitat and soil fertility.
			Soil contamination.
		Refuelling of construction vehicles and plant	Soil contamination.
			Water contamination.
		Handling, storage, disposal of hazardous waste	Unpleasant odours.
			Soil contamination.
			Water contamination
		Transportation of hazardous waste	Potential spillages of hazardous waste.
			Increase human safety risk.
			Greenhouse gas emission.
	Plant management (parking, driving, repair and maintenance, and refuelling)	Refuelling of construction vehicles and plant	Soil contamination.
			Water contamination.
		Bund area for fuel storage	Dust generation.
			Loss of vegetation, habitat and soil fertility.
			Soil contamination.
		Operation and movement of construction vehicles and plant	Dust generation.

Phase	Activity	Sub-activities	Aspects
			Increase in level of noise generation.
			Soil contamination.
			Increase human safety risk.
			Vibration.
			Greenhouse gas emissions.
	Building work (concrete work)	Water use and management	Water contamination.
			Misuse of available water.
		Spoil material generation and management	Dust generation.
			Loss of vegetation, habitat and soil fertility.
			Decline in the aesthetic quality of the environment.
		Excavation of suitable bedding and backfill material	Dust generation.
			Loss of vegetation, habitat and soil fertility.
			Increased potential for erosion.
	Disturbing natural areas	Slopes and slope stabilisation	Dust generation.
			Increased potential for erosion.
			Water contamination.
			Decline in aesthetic quality of the environment.
			Increase human safety risk.
		Topsoil stripping and storage	Dust generation.
			Loss of vegetation, habitat and soil fertility.
			Increased potential for erosion.
			Soil contamination.
			Reduced productivity of subsistence farmland.

Phase	Activity	Sub-activities	Aspects
			Encroachment and establishment of alien vegetation.
	Site closure & rehabilitation	Removal of structures and infrastructures	Increase in waste generation.
		Removal of inert waste and rubble	
		Hazardous waste and pollution control	
		Final shaping of disturbed areas	Increased potential for erosion.
		Topsoil replacement and soil amelioration	
		Ripping and scarifying	
		Planting	Reduced productivity of subsistence farmland.
		Grassing	
		Maintenance	Encroachment and establishment of alien vegetation.
		Management of alien vegetation	Loss of vegetation, habitat and soil fertility.
Operation (including maintenance)	Operation employment	Consultation with affected parties	Insufficient consultation.
		Employment of local labour	Insufficient employment of local labour.
			Presence of construction workforce.
			Influx of job seekers.
			Loss of farm labour to construction work.
	Consumption (energy, water, and other resources)	Water use and management	Water contamination.
			Misuse of available water.
		Cooking of food	Fire hazard.
			Illegal wood harvesting.
	Maintenance	Refuelling of construction vehicles and plant	Soil contamination.

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Phase	Activity	Sub-activities	Aspects
			Water contamination.
		Handling, storage & disposal of waste	Unpleasant odours.
			Soil contamination.
			Water contamination.
		Maintenance of sanitation systems	Unpleasant odours.
			Mismanagement of sewerage.
	Lighting to create visibility at night	Use of generators	Increase in level of noise generation.
			Soil contamination.
		Security	Trespassing.
	Terrestrial and aquatic ecological management	Use of herbicides	Loss of vegetation, habitat and soil fertility.
			Soil contamination.
		Harvesting of indigenous plants	Encroachment and establishment of alien vegetation.
		Overgrazing	Increased potential for erosion.
			Reduced productivity of subsistence farmland.
			Dust generation.
	PV panels and inverter (substation)	Cleaning & Maintenance	Water contamination.
			Misuse of available water.
	Social & community changes	Security	Trespassing.
		Fire Control	Loss of vegetation, habitat and soil fertility.
		Employment of local labour	Insufficient employment of local labour.
			Presence of construction workforce.
			Influx of job seekers.
			Loss of farm labour to construction work.

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Phase	Activity	Sub-activities	Aspects
		Visual aspects	Visual Intrusiveness.
Decommissioning (including rehabilitation)	Disposal of PV panels and other waste	Demolition activities	Dust generation.
			Increased level of noise generation.
			Vibration.
			Increase in waste generation.
			Increase human safety risk.
		Removal of inert waste and rubble	Decline in the aesthetic quality of the environment.
			Soil contamination.
		Relocation of previously existing services	Disruption in the provision of services.
	Human influence (staff conduct, movement)	Harvesting of indigenous plants	Loss of vegetation, habitat and soil fertility.
			Decline in the aesthetic quality of the environment.
		Fires for heat & cooking	Fire hazard.
			Loss of vegetation, habitat and soil fertility.
			Illegal wood harvesting.
		Littering	Decline in the aesthetic quality of the environment.
			Unpleasant odours.
			Increase in waste generation.
			Decline in the aesthetic quality of the environment.
		Noise	Increase human safety risk.
			Increase in the level of noise generation.
	Roads and access routes	Topsoil stripping and storage	Dust generation.
			Loss of vegetation, habitat and soil fertility.
			Increased potential for erosion.

Phase	Activity	Sub-activities	Aspects
			Encroachment and establishment of alien vegetation.
		Road decommissioning & rehabilitation	Dust generation.
			Increased level of noise generation.
			Soil contamination.
	Rehabilitation of affected footprint	Removal & transportation of structures and infrastructures	Increase in vehicle movement in area.
			Impact on the existing road conditions.
			Increase human safety risk.
			Increase in the level of noise generation.
			Greenhouse gas emissions.
			Increased potential for erosion.
		Maintenance & management of alien vegetation	Loss of vegetation, habitat and soil fertility.
			Increased potential for erosion.
		Planting & grassing	Reduced productivity of subsistence farmland.
		Topsoil replacement and soil improvement	Loss of vegetation, habitat and soil fertility.
		Final Shaping of disturbed areas	Increased potential for erosion.

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SECTION 4: LAYOUT MAP OF PROPOSED ACTIVITY

(c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers.

Apart from the abovementioned requirement (as stipulated in the EIA Regulations, 2014), three additional maps were required by the Department in their comments on the Final Scoping Report, dated 29th May, 2017 (quoted below).

"The Environmental Management Programme (EMPr) to be submitted as part of the EIAr must include the following:

ii. The final site layout map.

iv. An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.

v. A map combining the final layout map superimposed (overlain) on the environmental sensitivity map."

Figure 1. provides a map of the final site layout of the solar PV arrays and how they fit into the preferred alternative footprint. Figure 2. provides a map of the proposed preferred development footprint in the context of the surrounding environmental sensitivities. Figure 3 combines the information in the two preceding maps to consolidate all the available layers. The preferred footprint development has been determined through an iterative process, to ensure that it remains outside of all sensitive receptors assessed, including specified buffer zones.

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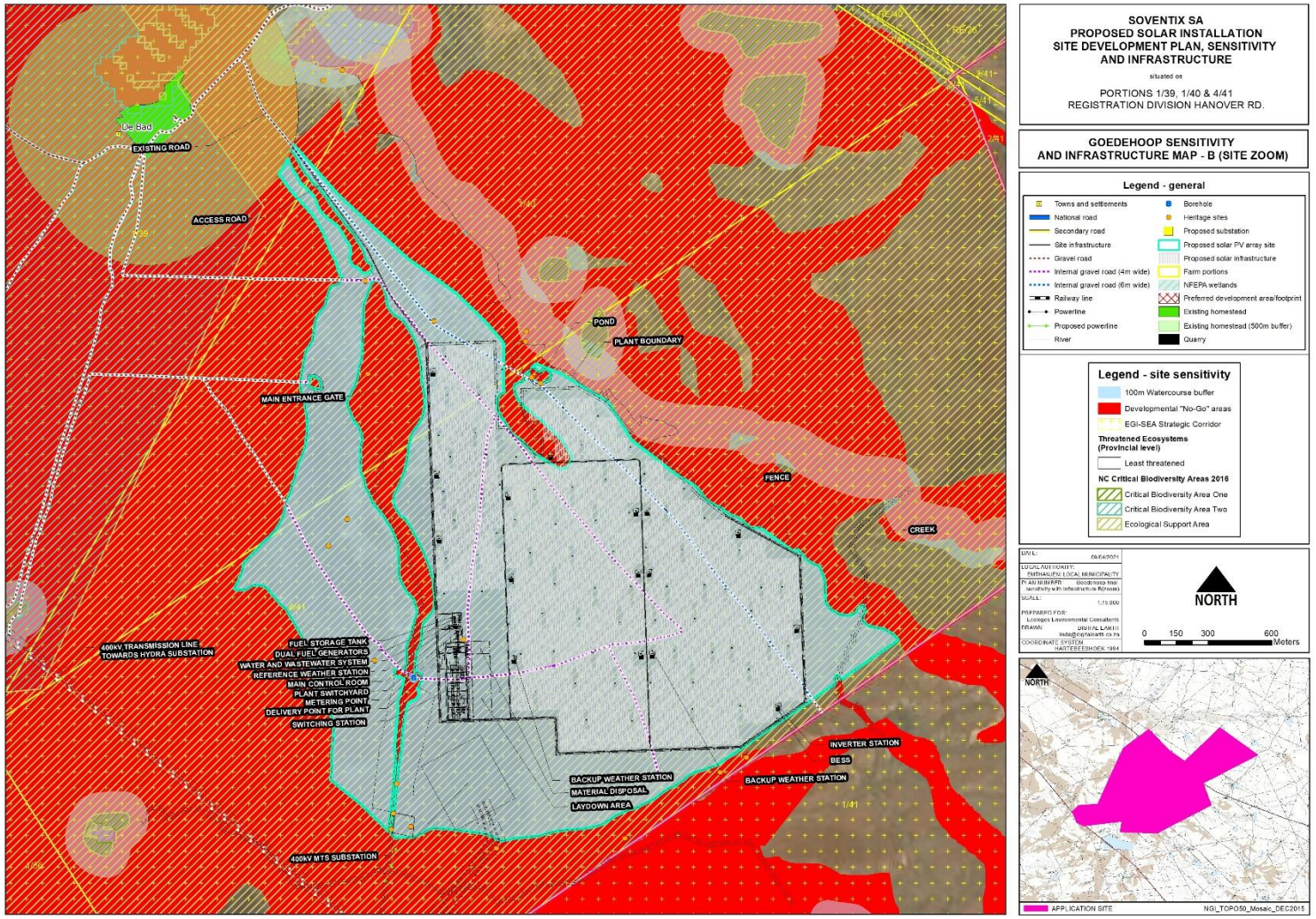

Figure 1. Approved development footprint with site infrastructure layout and sensitivity layer tailored for risk mitigation IPP procurement programme.

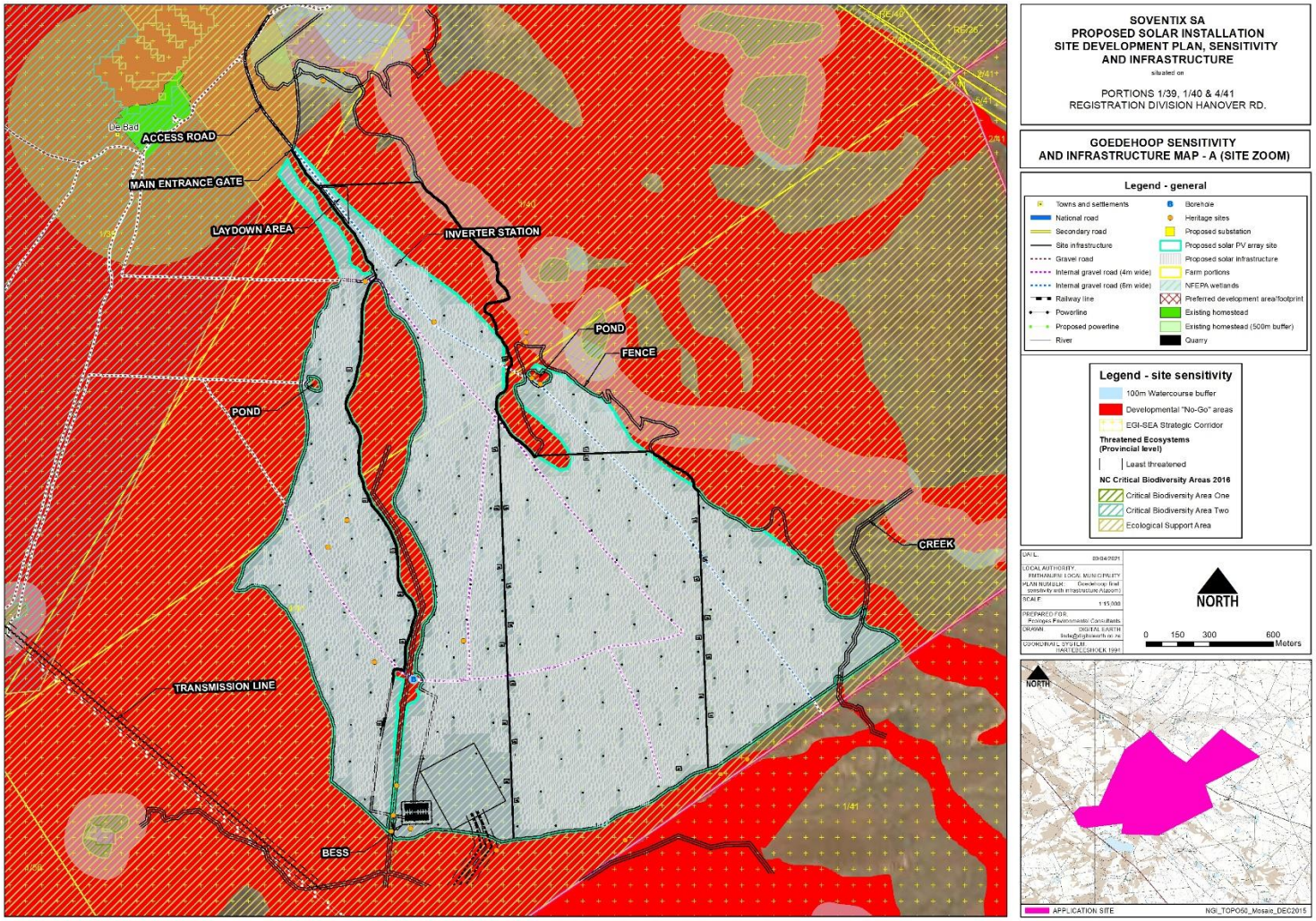

Figure 2. Approved development footprint with site infrastructure layout and sensitivity layer tailored for REIPPP BID rounds.

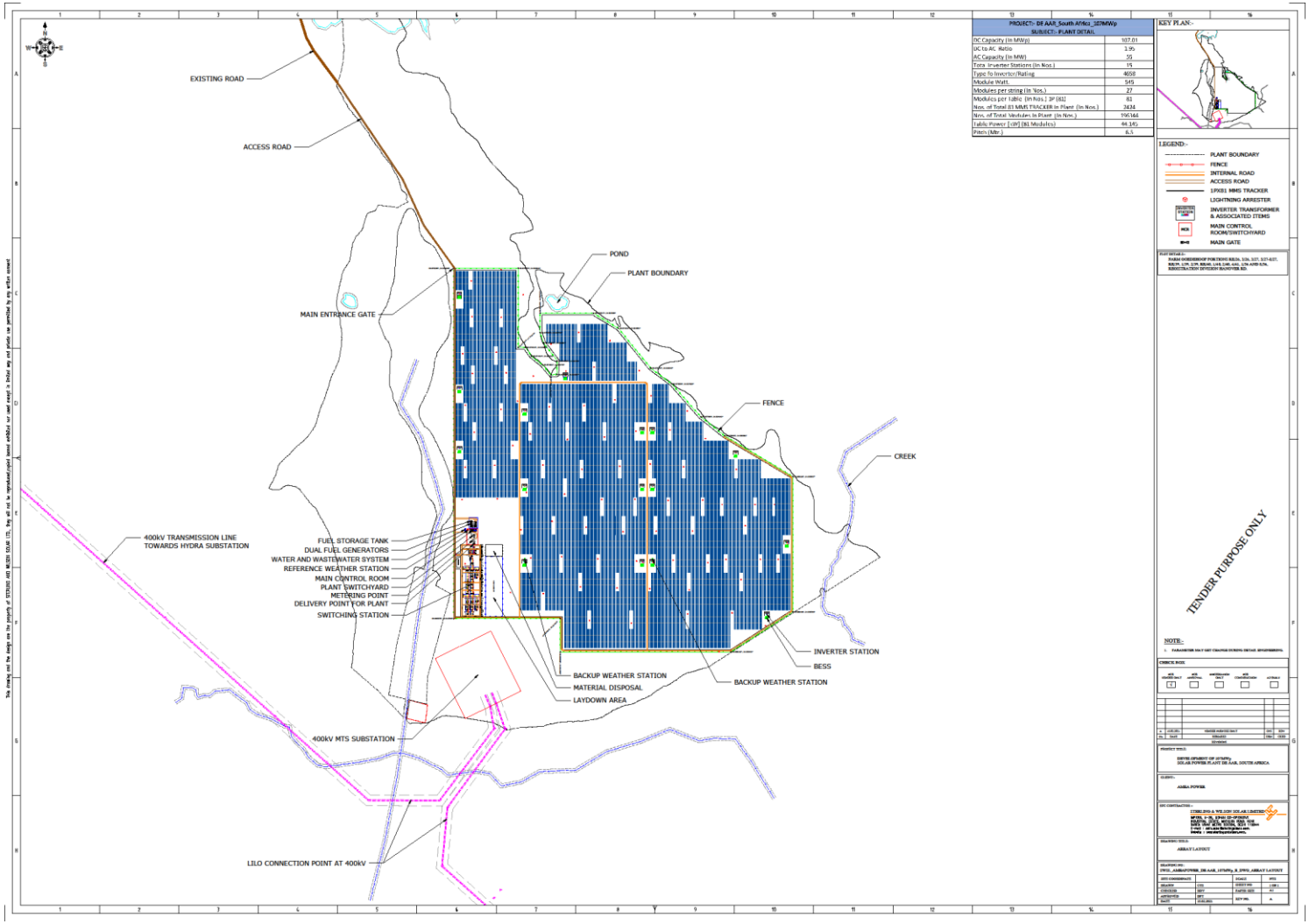

Figure 3. Site layout map including the location of the containerised battery storage and dual-fuel generators and associated fuel storage.

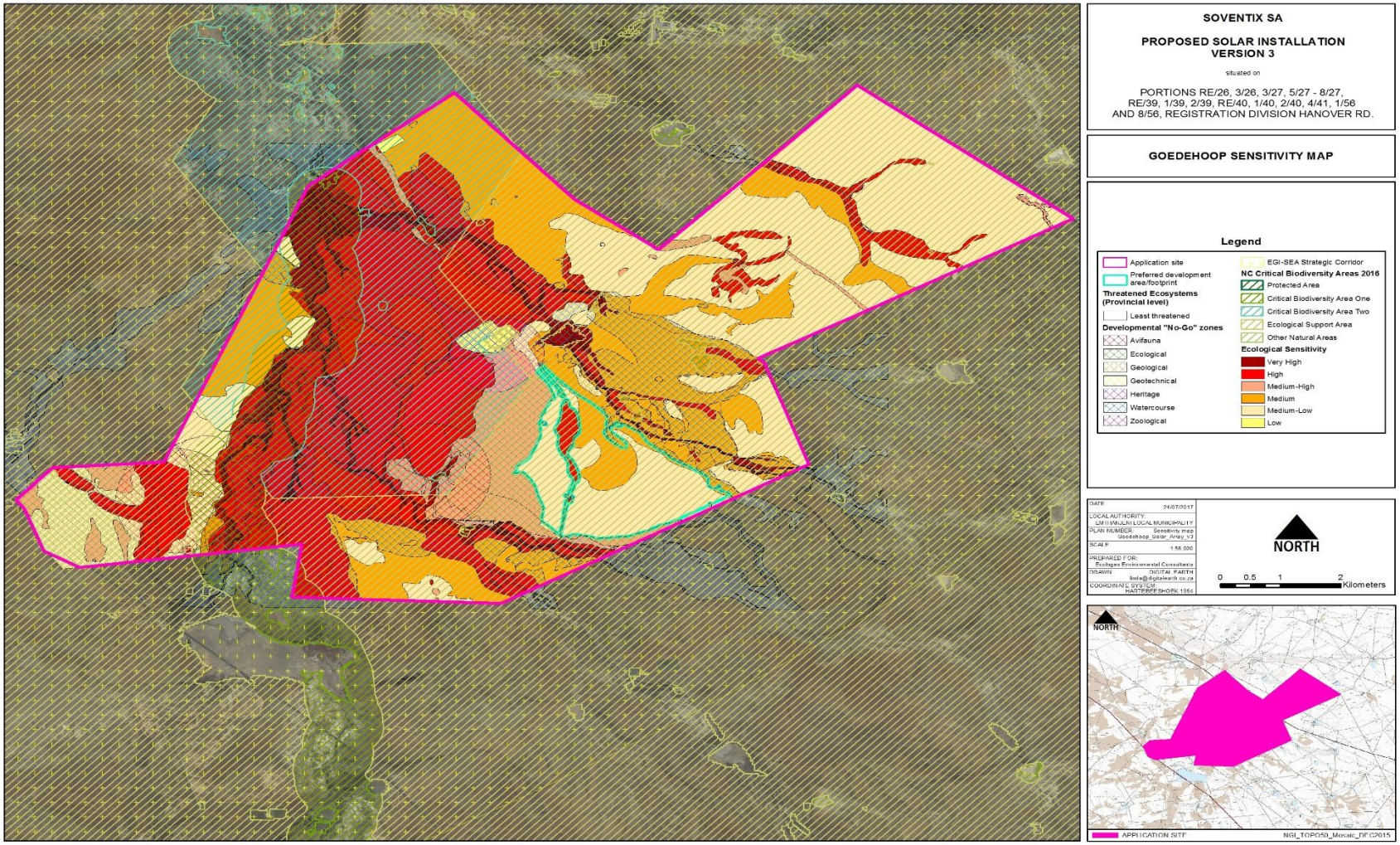

Figure 4. Site sensitivity map including proposed site development footprint.

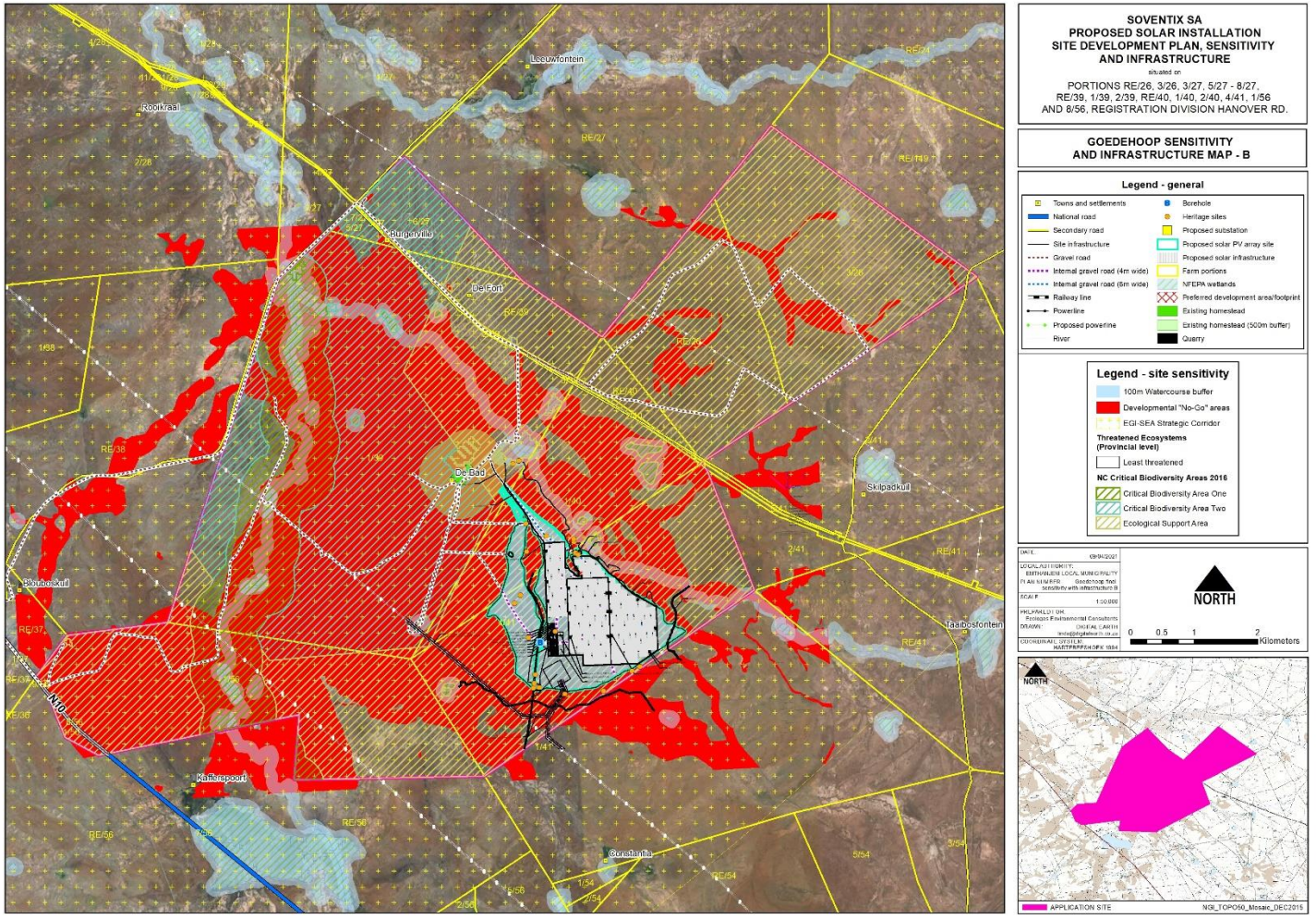

Figure 5. Infrastructure required for risk mitigation IPP procurement programme on approved development footprint, superimposed on the environmental sensitivity map (all sensitive areas consolidated & demarcated in red as “no-go” areas).

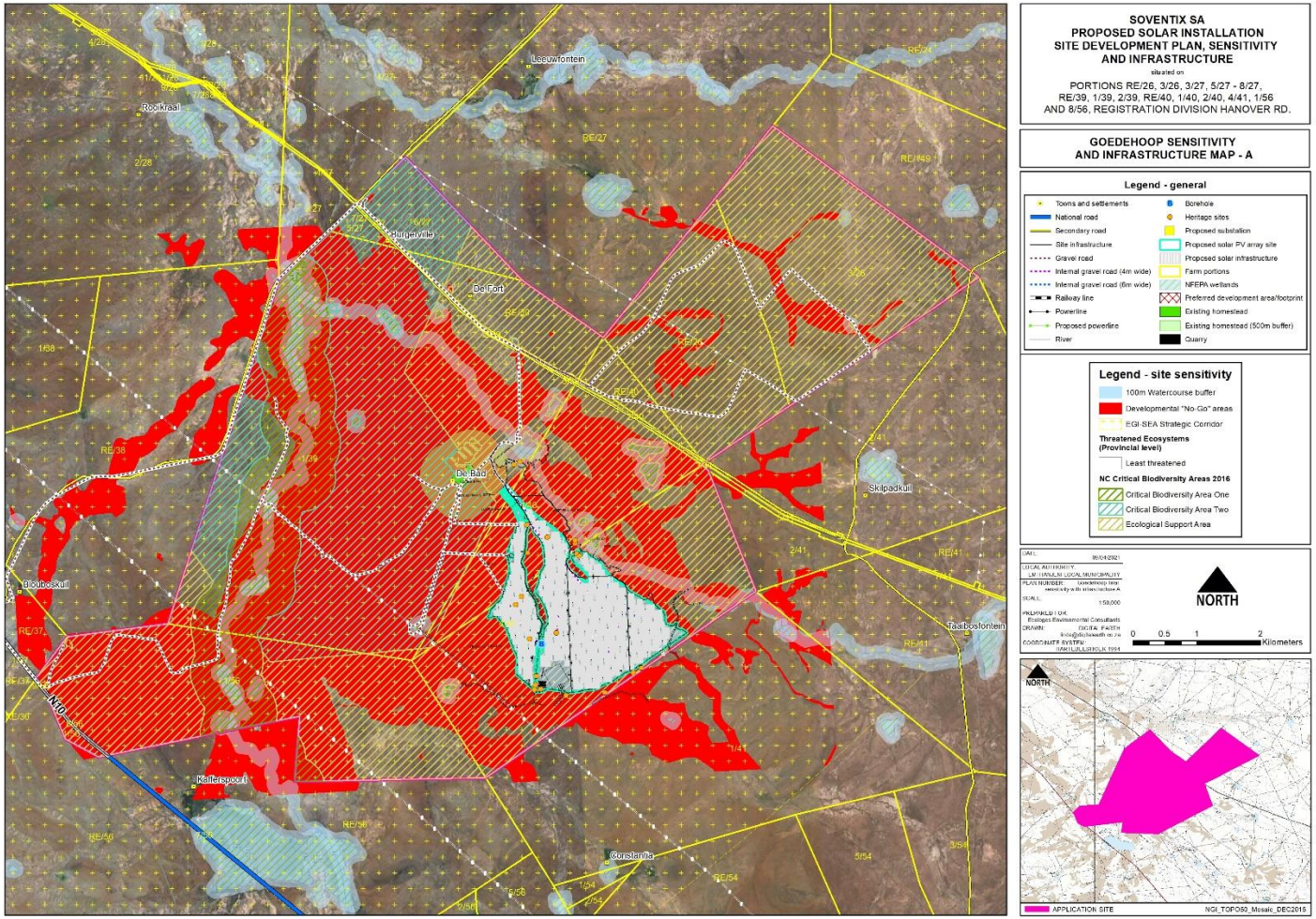

Figure 6. Infrastructure for BID round 5 and subsequent rounds on the approved development footprint, superimposed on the environmental sensitivity map (all sensitive areas consolidated & demarcated in red as “no-go” areas).

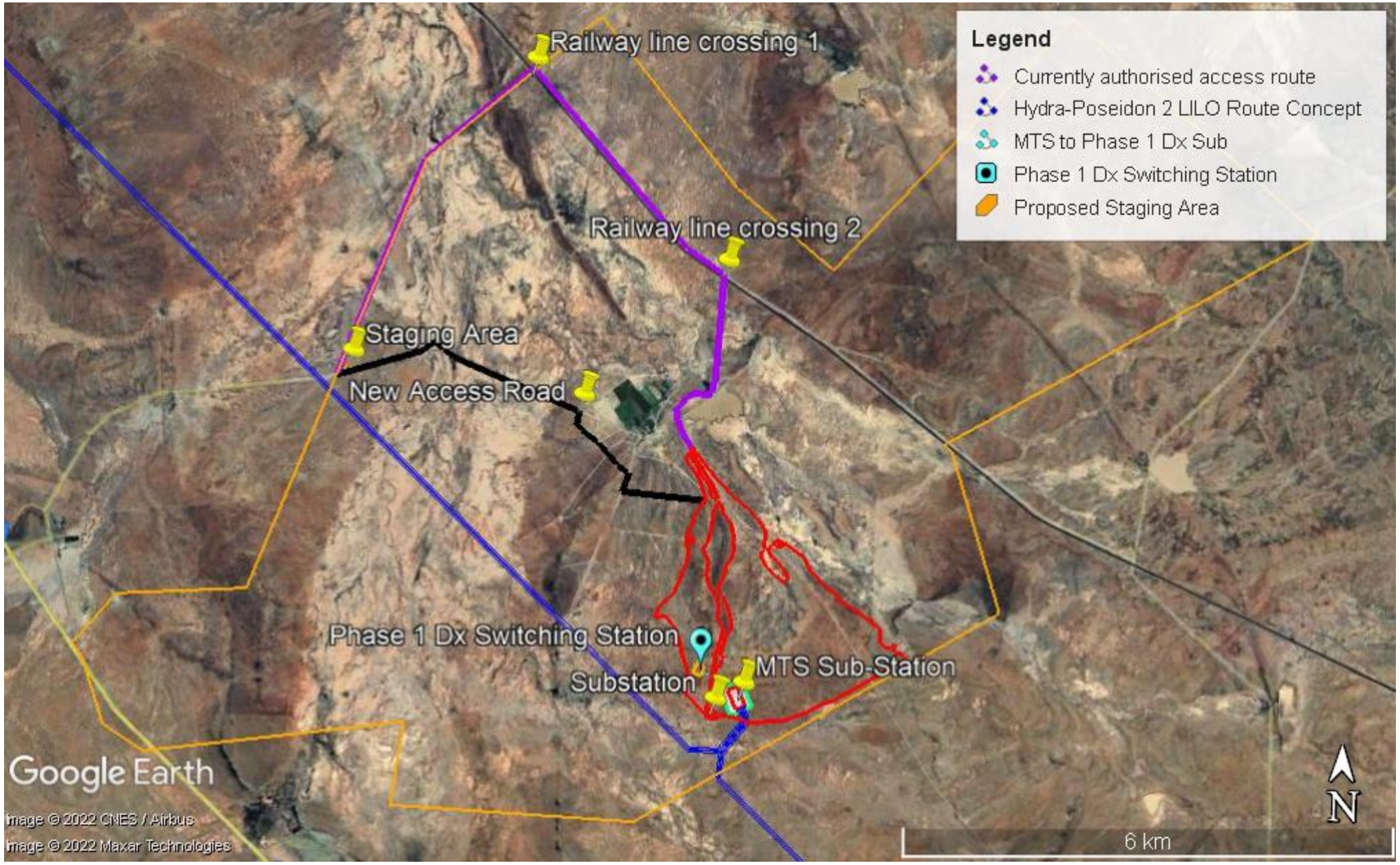

Figure 7. Amended layout to include the scope of the second Part 2 amendment to the project.

SECTION 5: ACTIVITIES, ASPECTS AND IMPACTS AND THEIR MANAGEMENT, MITIGATION & DESIRED OUTCOMES

(d) a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including-
(i) planning and design;
(ii) pre-construction activities;
(iii) construction activities;
(iv) rehabilitation of the environment after construction and where applicable post closure; and
(v) where relevant, operation activities;

(f) a description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to -

(i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
(ii) comply with any prescribed environmental management standards or practices;
(iii) comply with any applicable provisions of the Act regarding closure, where applicable; and
(iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;

(g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);
(h) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);
(i) an indication of the persons who will be responsible for the implementation of the impact management actions;
(j) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;
(k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);
(l) a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;
(m) an environmental awareness plan describing the manner in which-
(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and
(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and
(n) any specific information that may be required by the competent authority.

The impacts are considered within the scope of the project, including but not limited to the Listed Activities. The relevant impacts resulting from Listed Activities and associated activities, including environmental, socio-economic and cultural heritage, are informed by a predetermined list of potential environmental impacts (generated by way of a Leipoldt Matrix), comments received from Interested and Affected Parties and the findings contained in specialist studies that were used to generate the EIAr.

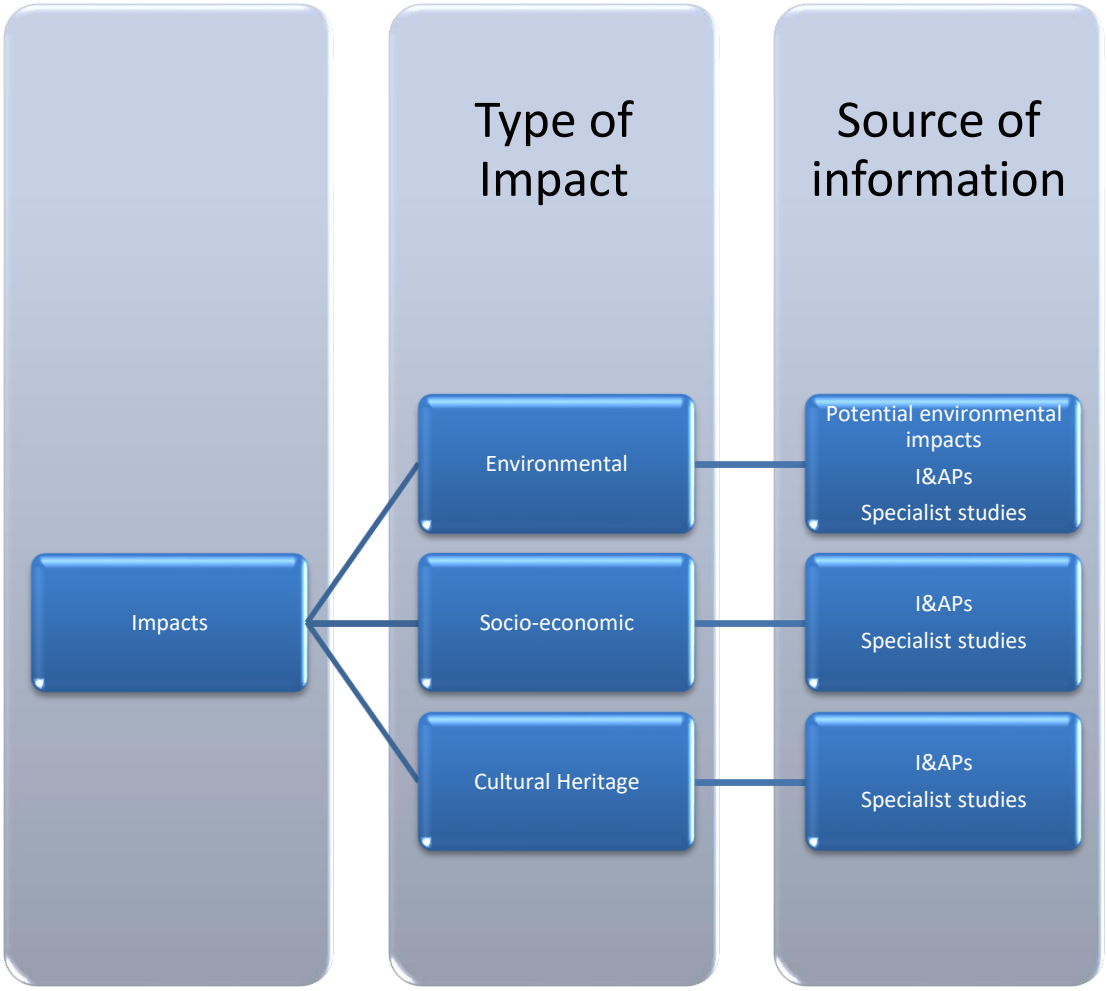

Figure 8. A breakdown of the different types of impacts including the resources used to identify them.

As stipulated in regulation 1(1)(d) of Appendix 4 of the EIA regulation (2104), as amended; the setting of desired impact management outcomes forms the principle objective of an EMPr. Outcomes are driven by impact management actions including measures and mitigations to avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; to comply with any prescribed environmental management standards or practices, including legal requirements and in some cases, “best practices” that the Implementer aspires to fulfil (e.g. Equator Principles). The outcomes are achieved by implementing and achieving measurable Targets (both quantitative & qualitative). Management and mitigation measures are set to afford guidance and parameters to the implementer to achieve the set outcomes. The following section describes management programmes for the

different environmental attributes pertaining to the Project. As part of the Management Programmes, the section describes the potential environmental impacts which may result from the identified aspects / activities, the desired outcomes of mitigating these impacts as well as the targets used to measure the level of environmental compliance and performance.

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

1. BirdLife South Africa – Position statement on the effect of solar power facilities on birds.
2. BirdLife South Africa – Guidelines to minimise the impact on birds of Solar Facilities and Associated Infrastructure in South Africa.
3. Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983), as amended including the regulations dealing with declared weeds and invader plants.
4. Constitution of the Republic of South Africa Act (Act 108 of 1996), including section 24.
5. DEA (2010), Public Participation 2010, Integrated Environmental Management Guideline Series 7, Department of Environmental Affairs, Pretoria, South Africa.
6. Department of Environmental Affairs (2013). Draft National Renewable Energy Guideline. Department of Environmental Affairs, Pretoria, South Africa.
7. DEAT (2002) Specialist Studies, Information Series 4, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
8. DEAT (2004) Environmental Management Plans, Integrated Environmental Management, Information Series 12, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
9. DWA (2007), Guideline for Developments within a Floodline (Edition 1), Department of Water Affairs and Forestry, Pretoria, South Africa.
10. DWS (2016) General Authorisation GN No. 509 in the Government Gazette No. 40229 dated 26 August 2016.
11. EIA Regulations, 2014 published in Government Notice No. R. 543, R. 544, R. 545, R. 546 and R. 547 in Government Gazette No. 38282 of 4 December 2014; and amended in GN No. R. 324, R. 325. R. 326 & R. 327 in Government Gazette No. 40772 of 7 April 2017.
12. Electricity Act (Act 41 of 1987).
13. Environment Conservation Act (Act 73 of 1989), including the noise regulations and litter controls promulgated thereunder.
14. Fencing Act (Act 31 of 1963).
15. General Authorisation in GN No. 538 in Government Gazette No. 40243 on 2 September 2016.
16. Land Use Planning Ordinance (Act 15 of 1985).
17. Minerals and Petroleum Resources Development Act (Act 28 of 2002) (MPRDA).
18. National Building Regulations and Building Standards Act (Act 103 of 1977).
19. National dust control regulations. GG No. 36974, GN No. R. 827, 1 November 2013.
20. National Environmental Management Act (Act 107 of 1998) (NEMA).
21. National Environmental Management: Air Quality Act (Act 57 of 2003) (NEM:AQA).
22. National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEM:BA).

23. National Environmental Management: Waste Act, 2009 (Act 59 of 2009) (NEM:WA).
24. National Forest Act (No 84 of 1998).
25. National Heritage Resources Act (Act 25 of 1999).
26. National Road Traffic Act (Act 93 of 1996).
27. National Veld and Forest Fire Act (Act 101 of 1998).
28. National Water Act (Act 36 of 1998).
29. Northern Cape Nature Conservation Act, 2009 (Act 9 of 2009).
30. Occupational Health & Safety Act (Act 85 of 1993).
31. Schedules 4 and 5 of the National Regulations regarding Noise Control made under Section 25 of the Environment Conservation Act, 1989 (Act 73 of 1989) in GN No. R 154 of Government Gazette No. 13717 dated 10 January 1992. (Note that this particular section of the Environment Conservation Act is not repealed by NEMA (Act 107 of 1998)).
32. Subdivision of Agricultural Land (SALA), Act 70 of 1970.
33. Visser, E. 2016. The impact of South Africa's largest photovoltaic solar energy facility on birds in the Northern Cape, South Africa. Unpublished MSc thesis, University of Cape Town, Cape Town.

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The following management programme aims to set management actions to achieve stated desired outcomes for each environmental aspect, including quantifying the measurable targets. While the impacts and management & mitigations have been addressed under the various project development phases, they are not intended to be mutually exclusive, and impacts from one phase are likely to occur in subsequent phases; but in the interest of reducing redundancy they have not been repeated for each phase. The appendices to this EMPr form part of the EMPr and must be implemented accordingly. In the event that conditions with the following tables in anyway contradict the conditions of the aspect specific Management Plans (MP) in the appendices, the MP conditions must take precedent.

TABLE 6. COMPLIANCE MANAGEMENT.

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
6.1	**All Phases with special emphasis on Planning & Design Phase (including Pre-Construction)**						
6.1.1	**PROTECTED SPECIES**						
6.1.1.1	Impacts on protected plants.	Comply with the relevant sections of the National Forest Act (NFA) (Act 84 of 1984), National Environmental Management: Biodiversity Act, 2004 (NEM:BA) (Act No. 10 of 2004), and the Northern Cape Nature Conservation Act	Obtain and provide proof of issuance of necessary permits for any listed species under NFA, NEMBA & NCNCA.	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. The list of affected plants are contained in the Terrestrial Ecology Specialist Report, which will need to be searched for in the appropriate season &	Applicant / Contractor to appoint botanist.	Prior to commencement of construction.	Compliance to be verified by ECO & IEA.

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
		(NCNCA) (Act 9 of 2009).		rescued if present, by a qualified ecologist / botanist prior to clearing operations. • *Stomatium pluridens;* • *Euphorbia crassipes,* (regional endemics and provincially protected); • *Aloe broomii* var. *broomii;* • *Aloe claviflora;* • *Pachypodium succulentum;* • *Ammocharis coranica;* and • *Boscia albitrunca.*			
6.1.2	**WATER USE AUTHORISATION TO WORK WITHIN A WATERCOURSE**						
6.1.2.1	Contravention of section 21 (c) & (i) of the NWA.	The commencement of water uses that are authorised in terms of the	Confirmation letter from DWS on General Authorisation (GA) registration	The applicant shall register a water use entitlement, i.e. a GA or WUL for section 21(c) and (i) water uses, prior to constructing/upgrading	Applicant / EAP.	Prior to commencement of construction.	Compliance to be verified by ECO & IEA.

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
		NWA, 1998 (Act No. 36 of 1998).	(GN. No. 509, GG. No. 40229, 26 August 2016); or an issued Water Use License (WUL).	access roads and erecting pylons inside a watercourse.			
6.1.3	**WATER USE AUTHORISATION FOR TREATING & STORING WASTEWATER**						
6.1.3.1	Contravention of section 21 (g) of the NWA.	The commencement of water uses that are authorised in terms of the NWA, 1998 (Act No. 36 of 1998).	Confirmation letter from DWS on relevant General Authorisation registration (GN. No. 665, GG. No. 36820, 6 September 2013); or an issued Water Use License.	The applicant shall register a water use entitlement, i.e. a General Authorization or WUL for section 21(g) water uses for the treatment of effluent via a package waste water treatment works (WWTW) (Biorock™), NewGen Containerized WWTW and Conservancy Tank/s for the storage of contaminated water from washing brushes and other tools as well as the dirty water from washing the ready mix concrete trucks.	Applicant / EAP.	Prior to commencement of construction.	Compliance to be verified by ECO & IEA.

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
6.1.4	**WATER USE AUTHORISATION FOR ABSTRACTION & STORAGE OF RAW & TREATED WATER**						
6.1.4.1	Contravention of section 21 (a) of the NWA.	The commencement of water uses that are authorised in terms of the NWA, 1998 (Act No. 36 of 1998).	Confirmation letter from DWS on relevant General Authorisation registration (GN No. 538, GG No. 40243 on 2 September 2016; or an issued Water Use License.	Water required during construction and operation for human consumption (drinking, sanitation and food preparation), building activities (mixing concrete, watering gravel roads), livestock and maintenance (cleaning solar panels) shall be pre-authorised via a General Authorisation or Water Use License.	Applicant / EAP.	Prior to commencement of construction.	Compliance to be verified by ECO & IEA.
6.1.4.2	Depletion of already constrained groundwater resource	Utilisation of borehole water within the General Authorisation or Water Use License limit.	Records demonstrating abstraction volumes in compliance with GA or WUL limits.	Abstraction must not exceed the limits prescribed in the GA for this area, and Abstraction volumes must be measured and recorded against the limit prescribed in the GA or WUL.	Applicant / Contractor.	Prior to commencement of construction.	Compliance to be verified by ECO & IEA.
6.1.4.3	Provision of potable water	Conformance to SANS 241: 2015 standards.	Certificate of Analysis (CoA) demonstrating	Sampling of water destined for human consumption must be submitted to a	Applicant / Contractor.	Prior to commencement of construction.	Compliance to be verified

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
			conformance to SANS 241:2015 water quality standards.	laboratory accredited for the water quality elements specified in SANS 241:2015 and/or a WUL, at the specified time intervals.			by SEO, ECO & IEA.
6.1.5	**WATER USE AUTHORISATION FOR IRRIGATION/DUST SUPPRESSION WITH TREATED WASTEWATER**						
6.1.5.1	Contravention of Section 21(e) of the NWA.	The commencement of water uses that are authorised in terms of the NWA, 1998 (Act No. 36 of 1998) and compliance with the required treated effluent quality.	Confirmation letter from DWS on relevant General Authorisation registration (GN No. 538, GG No. 40243 on 2 September 2016; or an issued Water Use License and physico-chemical laboratory results demonstrating compliance with	The applicant shall register a water use entitlement, i.e. a General Authorization or WUL for section 21(e) water uses for the reuse of treated effluent for dust suppression and/or irrigation emanating from the waste water treatment works (WWTW) (BiorockTM) and NewGen. Sampling of treated effluent from the WWTWs must be submitted to a laboratory accredited for the water quality elements specified in	Applicant.	Prior to utilisation of WWTs.	Compliance to be verified by SEO, ECO & IEA.

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
			effluent quality requirements.	Tables 1.1, 1.2 or 1.3 (dictated by volumes irrigated) in accordance with the frequencies specified in GN No. 538 of 2 September 2016 or a WUL. A treated effluent & water sampling protocol for all water uses must be developed which guides and governs the sampling procedures in accordance with guidelines provided by DWAF (2000), Water Research Commission No: TT 117/99.			
6.1.5	**Access Roads**						
6.1.5.1	The construction or expansion of any access roads in exceedance of	Existing roads to be utilised with addition of with limited tracks	Existing roads were not widened by more than 6m	Newly constructed service roads may not be wider than 4 metres with a reserve less than 13.5 metres, nor the	Applicant / Contractor.	Prior to commencement & throughout construction.	Compliance to be verified by ECO & IEA.

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
	thresholds stipulated in NEMA listed activities, 2014.	necessary for service only within the development footprint.	or lengthened by more than 1km. Newly constructed service tracks were not made wider than 4m. The cumulative area cleared for widening and lengthening existing roads, constructing new service tracks and other infrastructure (substation and office block/laydown area) did not exceed 20ha.	widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre.			

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
6.1.6	**Servitudes and Wayleaves**						
6.1.6.1	Construction without permission from ESKOM will constitute an offence in terms of the relevant legislation, including the Electricity Act, 1987 (Act 41 of 1987), as amended in 1994.	Compliance with the Electricity Act, 1987, as amended. Compliance with the Eskom requirements for work in or near servitudes & Renewable Energy Generation Plant Setbacks to Eskom Infrastructure (240-65559775 Rev 2).	Wayleave issued by Eskom. Demonstration of implementation of requirements for work in or near an Eskom servitude & Renewable Energy Generation Plant Setbacks to Eskom Infrastructure.	The applicant shall apply for a wayleave(s) from Eskom prior to commencing with construction within their servitude. The applicant shall comply with the Eskom requirements for work in or near Eskom servitudes and the Renewable Energy Generation Plant Setbacks to Eskom Infrastructure.	Applicant / EAP.	Prior to commencement of construction activities within Eskom's servitude.'	Compliance to be verified by ECO & IEA.
6.1.7	**Compliance Monitoring**						
6.1.7.1	Commencement of construction prior to the appointment of an ECO.	Ensure compliance with the EA and EMPr from the onset of	Proof of ECO appointment prior to	A qualified, suitably experienced & accredited independent ECO must be appointed (registered with	Applicant.	Prior to commencement of construction and until the	To be verified by IEA.

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
		construction and until the rehabilitated development is handed over to the Applicant for operation.	commencement of construction.	SACNASP & EAPASA) to monitor and report to the competent authority on compliance with the EA and EMPr, and where necessary oversee or facilitate the identification and permitting / licensing of protected species prior to clearing of any vegetation.		rehabilitated development is handed over to the applicant for operation. The minimum frequency for ECO inspections is monthly.	
6.1.8	**Municipal By-laws**						
6.1.8.1	Commencement of construction prior to submission and approval of building plans by the Emthanjeni Local Municipality.	Local municipality approval of building plans.	Issuance of a certificate referred to in section 118(1) of the Local Government: Municipal Systems Act (Act 32 of 2000).	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).	Applicant.	Prior to commencement of construction.	Compliance to be verified by SEO, ECO & IEA.
6.1.9	**Environmental Authorisation amendment approval**						

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
6.9.1	A Part 2 amendment must be approved prior to implementation of expansion of the project scope to include containerised battery storage and backup generators (with associated fuel storage)	Approval of part 2 amendment for expanded project scope.	Receipt of part 2 amendment approval on record.	The applicant shall be guilty of an offence and upon conviction liable to a fine and / or imprisonment if the expanded scope commences without an approved Part 2 amended EA, issued by the DEFF.	Applicant.	Prior to commencement of construction.	Compliance to be verified by SEO, ECO & IEA.
6.1.10	**Approval for leasing of agricultural land**						
6.1.10.1	Commence of project in the absence of the necessary approvals relating to Sub-division of Agricultural Land Act (SALA, Act 70 of 1970).	Written Ministerial approval of lease of agricultural land.	Receipt of lease approval by Minister under SALA for the approved PV02 footprint.	The project may not commence without the necessary approvals relating to Sub-division of Agricultural Land Act (SALA, Act 70 of 1970).	Applicant and appointed Town Planner.	Prior to commencement of construction.	Compliance to be verified by SEO, ECO & IEA.
6.1.11	**Design capacities & criteria**						

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
6.1.11.1	The design capacities of the generators and the above-ground fuel storage may not exceed the stipulated thresholds.	The design capacity of the dual-fuel generators must not exceed the threshold stipulated in Subcategory 1.5: Reciprocating Engines in GN Government Notice 248, Gazette 33064 dated 31 March 2010, as amended. The above-ground storage of fuel may not exceed the threshold of 80m^3 stipulated	The combined generator design capacity may not exceed 10MW. The above-ground fuel storage facility may not exceed 80m^3 in capacity and must be located outside an Identified Geographical Area (IGA). In the event that the storage occurs within an IGA the storage threshold is 30m^3.	The applicant must ensure that the generator design capacity/ies do not individually or collectively exceed 10MW in the absence of the relevant environmental authorisation under NEMA. The above-ground fuel storage tank/s must not exceed 80m^3, or 30m^3 in an Identified Geographical Area (IGA), either individually or collectively, in the absence of the relevant environmental authorisation under NEMA.	Applicant.	Prior to commencement of construction.	Compliance to be verified by SEO, ECO & IEA.

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
		in Listed Activity 14 & 10 of GN GG No. 38282, GN No. R. 983 & 985, 4 December 2014, respectively, as amended.					
6.1.11.2	Nuisance & disturbance noise impacts associated with ineffective noise suppression of GENSETs.	Installation of adequate noise suppression on dual-fuel GENSET units.	Demonstration of noise suppression technology in design.	Ensure the specification of the GENSETs includes noise dampeners to reduce noise emissions.	Applicant.	Prior to commencement of construction.	Compliance to be verified by Applicant, SEO, ECO & IEA.
6.1.11.3	Inadequate consideration of the site-specific geotechnical attributes & constraints.	Geotechnical attributes considered in the final location and foundation designs for GENSET and BESS units.	Demonstration that the findings of the geotechnical assessment and soil form delineation assessment	The final location, layout and foundational designs must consider that the current location of the Eskom substation will be located along a low-lying part of the southern site border and adjoining the dolerite dike underlying the central	Applicant.	Prior to commencement of construction.	Compliance to be verified by Applicant, SEO, ECO & IEA.

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			informed the design criteria.	exclusion zone. It should be noted that periodic inundation in that area during the rainy season cannot be ruled out. Furthermore, the dolerite rock adjoining the substation to the west may possibly underlie the western parts of the substation area. Excavation is expected to be more difficult for the parts underlain by dolerite than for the eastern parts of the substation area – which are underlain by sandstone. It is thus suggested that the GENSET & BESS units be upslope of the sub-station and biased toward the East on the sandstone areas.			
6.1.11.4	Battery leakage with concomitant contamination of the soil.	Containers act as an effective bund to retain any	Container design demonstrates	The applicant should ensure that the design of the Battery containers are suitably	Applicant.	Prior to commencement of construction.	Compliance to be verified by Applicant,

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
		accidental leakages.	bunding capability.	bunded to effectively contain any accidental leakages.			SEO, ECO & IEA.

TABLE 7. CONSTRUCTION CAMP, LAYDOWN AREAS, STOCKPILES, STORES & EQUIPMENT.

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
7.1	**Planning & Design Phase (including Pre-Construction)**						
7.1.1	Land surface pollution.	Low risk of pollution or harm to sensitive environments from the inappropriate location of construction related sites within or within proximity to those sensitive environments.	Approved and effectively implemented layout plan indicating designated construction-related sites.	A construction site layout plan must be developed by the contractor and approved by the SEO to ensure that all construction related sites are located outside sensitive environments, including no-go areas and buffer zones. Furthermore, those construction related sites or activities with the greater risk or potential for causing pollution or harm to the receiving environment, including but not necessarily limited to laydown	Applicant / Contractor	Prior to commencement of construction.	SEO, ECO & IEA.

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				areas, material stockpiles, toilets, waste skips and stores, must not be within close proximity to the aforesaid sensitive environments, i.e. these construction related sites or activities must not, as far as is practical, be located on the watercourse-side of any construction camp or area demarcated for construction activities.			
7.1.2	Degradation of the environment outside of the development footprint.	Zero construction creep into and subsequent degradation of areas outside the preferred or approved development footprint.	Approved and effectively implemented (demarcated on site) layout plan indicating all environmental sensitivities, especially no-go areas,	Permanent and temporary construction footprints must be designated, and sensitive terrestrial & aquatic habitats demarcated as no-go areas during construction, including required buffer zones. The Contractor shall locate the construction camp on existing disturbed or the least sensitive sites above the 1:100-year flood	Applicant / Contractor	Prior to and ongoing enforcement during construction.	SEO, ECO & IEA.

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				line or further than 100m from the edge of a watercourse (buffer zone), whichever is greatest. The project footprint must be clearly demarcated on the ground to ensure that no construction creep results toward any watercourses or defined sensitive areas. Placement of infrastructure and laydown & stockpile areas must be done so as not to negatively affect surface water runoff in a way that leads to erosion and export of material to be deposited in any watercourses.			
7.2	**Construction Phase**						
7.2.1	Land surface pollution.	To avoid and reduce human induced environmental pollution.	Incident registers that indicate reduction in pollution events,	Emergency breakdowns in the parking areas or along roads, must be addressed with immediate and adequate pollution containment measures have been implemented	Applicant / Contractor	Throughout construction.	SEO, ECO & IEA.

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
			from the operation of construction plant, equipment or other vehicles, over time.	including but not limited to drip trays and spill kits. No washing, other than ready-mix concrete trucks at a designated area within the construction camp, and no repairs or servicing of construction plant, equipment or other vehicles, except for emergency breakdowns, are permitted within the preferred or approved development footprint, construction-related areas, no-go areas and on neighbouring properties. The contractor(s) and any sub-contractors, including their employees, are prohibited from entering the designated no-go areas (Figure 3) for whatever reason and without the prior written consent of the SEO.			

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				Refuelling of vehicles and plant may only take place at a designated and permitted (from local Fire Chief) fuel storage tank or mobile fuel bowser, under the guidance of a Specific Operating Procedure (SOP) that limits spillage and addresses remedial actions in the event of a spillage. The contractor shall restrict the following activities to the construction camp: - Sanitation, - Waste storage, - Parking, - Storing hazardous materials, - Emergency vehicle & plant repair & maintenance as far as practicable, - Re-fuelling,			

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				- Ready-mix concrete truck cleaning area - Material stockpiles (excluding works within the Brak River for the construction of the pylon), and - Lay down areas. 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. Biorock Monoblock WWTW must be installed at commencement of establishment of Staging Area to ensure adequate ablutions & shower facilities are provided. Use drip trays for refuelling, emergency repair / maintenance			

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				work and all stationary construction plant and equipment that can leak, such as TLBs, compressors and generators. Washing of 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.			
7.2.2	Noise pollution.	To avoid nuisance noise to affected landowners & occupiers and reduce noise impacts to the environment.	Noise must fall within the parameters set by: **1.** (SANS) Standard 10103:2008: The measurement and rating of environmental	Noise generation must be managed, including the use of radios and other music playing appliances. Vehicles and plant must be in a good state of repair to limit noisy operations.	Applicant / Contractor.	Frequency of monitoring as stipulated in relevant regulation and standard, as amended from time to time.	SEO or appointed specialist service provider. Verification to be done by ECO & IEA.

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
			noise with respect to annoyance and speech communication. **2.** DEA Regulations No. R.154. Noise Control Regulations promulgated in terms of Section 25 of the Environment Conservation Act, 1989 (Act No. 73 of 1989). GG No. 13717, 10 January 1992. **3.** Any applicable provincial and municipal By-	All equipment must not emit nuisance or disturbance causing noise.			

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
			Laws regarding noise control.				
7.2.3	Degradation of the environment outside of the development footprint.	To avoid impacts to the biodiversity integrity and ecological function of areas outside the development footprint (including installation of the connection powerlines to the existing ESKOM overhead lines).	No impacts outside the development footprint. All contraventions to be recorded in incident register.	Imported material stockpiles shall be located outside the demarcated wetland system and on a disturbed site or other site approved as a stockpile area. No residues of stockpiled material must be left on site, that can impede restoration of ecological function and remain a visual intrusion on the landscape. Disturbed habitats resulting from construction-related activities must be rehabilitated immediately after the cessation of those activities on or near the disturbed habitats. The alignment of fences or roads and the placement of potential impediments, such as walls,	Applicant / Contractor.	Update to incident register following each contravention.	ECO & IEA.

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				laydown & material stockpile areas must not alter surface water runoff patterns (i.e. impede or increase surface water runoff) in a way that will cause ponding or erosion and sedimentation of a watercourse.			
No significant operational or decommissioning impacts expected.							

TABLE 8. WASTE MANAGEMENT (generation, handling, storage and disposal, including hazardous waste).

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
8.1	**Planning & Design Phase (including Pre-Construction)**						
8.1.1	Shortening the lifespan of the local waste disposal sites.	To minimise the generation of project-specific waste by implementing an effective waste management strategy based on the waste hierarchy.	Keep accurate records of waste volumes (litres, kg and / or m^3) generated by type.	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. Induct all labourers on the waste management strategy and enforce it	Applicant / Contractor (SEO).	Prior to commencement of construction with ongoing maintenance and updates to Strategy.	ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				through regular (at least weekly) toolbox talks. Keep accurate records of waste generated by type.			
8.2	**Construction Phase**						
8.2.1	Removal of inert Waste and rubble. Loss of ecological function and agricultural potential.	Maintain ecological function and agricultural potential'	Zero concrete hard pan layers observed on the ground.	In the event of concrete hard pan layers, break up all concrete hard pan layers and dispose of appropriately (at a legitimate dump site) or re-use the concrete.	Applicant / Contractor (SEO).	For each disposal event.	ECO & IEA.
8.2.2	The high economic cost of disposing hazardous waste at authorised landfills, and potential contamination of land by illegal dumping.	The reduced generation of hazardous waste and the avoidance of environmental (land and water) contamination.	Indicators and trends in hazardous waste generation and management over time while considering amount of active construction to contextualise efforts.	The contractor shall contain contaminated water from washing brushes and other tools as well as the dirty water (possibly hazardous) from washing the ready mix concrete trucks, in a conservancy tank until sufficient volume warrants disposal by a registered	Applicant / Contractor (SEO).	Throughout construction.	ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
			All waste waybills and landfill licenses in register and on file.	hazardous waste management company. The contractor shall return used oil to the supplier or an oil recycling company. The Waste Water Treatment Package Plant should be constructed at the onset of construction activities, to ensure the reduction of hazardous waste production.			
8.2.3	Solid and liquid waste can be harmful to fauna if swallowed / ingested or if the creature becomes entangled or impaled.	Healthy animals (wild and domesticated).	Zero incidence (in the incident register) of waste induced harm to wildlife or livestock. No litter observed in the development	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.	Applicant / Contractor (SEO).	Throughout construction.	ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
			footprint and no-go areas.	Do not litter and ensure sound housekeeping.			
8.2.4	Improper handling, storage or disposal of waste can cause toxicity – the introduction of toxic or hazardous substances into a watercourse - spills can be washed into the watercourse by storm water run-off.	To ensure sound waste management practices that do not affect any aquatic environments.	Zero incidence (in the incidence register) of waste induced impacts on aquatic environments.	Hard-surfaces and parking areas with storm water outlets should not channel litter, oil and fuel spills into a watercourse, causing water pollution. The contractor is prohibited from discharging waste water, including domestic water from sanitation facilities, into a watercourse. The contractor shall store & contain hazardous chemicals within a secure, safe and bunded facility at the construction camp, to ensure spillages do not enter any aquatic environments.	Applicant / Contractor (SEO).	Throughout construction.	ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
8.2.5	Construction activities will produce solid and liquid waste, which can contaminate the ground (litter, spillage) if improperly handled, stored or disposed.	To reduce contamination of the soil through improper management of waste.	Low incidence of waste induced ground contamination, with a trend indicating constant improvement over time (not just quantities but procedural. improvements too). Suitable close-out documentation and reviews of SOPs & MS following significant contamination events.	Do not mix concrete on open ground. Mix in a wheel barrow, a mixing tray or on a level plastic sheet. In the event of a leak or spill onto the ground, 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.	Applicant / Contractor (SEO).	Throughout construction.	ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				The burning, burying or illegal dumping of waste is prohibited. When handling hazardous materials, such as when refuelling vehicles or generators, the contractor shall implement appropriate precautionary measures, such as a ground cover or drip trays, to prevent spills from contaminating the ground. The contractor shall prevent the run-off of slurry or cement contaminated water from concrete / plaster mixing sites.			

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				Adequate waste receptacles must be available, including those that track with the active work fronts, to ensure effective waste management. Remove ineffective danger tape / netting that has begun to litter the site or surrounding areas. Follow housekeeping rules in order to avoid littering (littering is likely to be more prevalent at designated eating / rest areas).			
8.2.6	The contamination of soil.	To reduce the amount of hazardous waste, specifically	Sound management & disposal of contents of drip	Use drip trays for refuelling, emergency repair work and all stationary construction plant and equipment that	Applicant / Contractor (SEO & Plant Operators).	Throughout construction.	ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
		contaminated soil, that is generated during construction.	trays and / or utilisation of alternative hydrocarbon absorbents in drip trays. Zero sand observed in drip trays and bunds. Zero spills or leaks observed under or near stationary construction plant and equipment.	can leak, such as TLBs, compressors and generators. Drip trays must be regularly emptied or they can be filled with hydrophobic hydrocarbon absorbent material to avoid the content from overflowing during rainfall events.			
8.2.7	The contamination of soil (and generation of waste) by undesirable practices.	To reduce the amount of hazardous waste, specifically contaminated soil, that is generated	Zero observations of spills covered with soil.	Do not cover spills with virgin soil. It merely increases the disposal cost for a greater volume of hazardous waste.	Applicant / Contractor.	Throughout construction.	ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
		during construction.		Utilise as an alternative, hydrocarbon absorbents, for spillages.			
8.2.8	Use of packaging material in townships, which is illegal and creates a fire hazard.	Prevent or reduce the spread of township fires started or fuelled by project-specific waste packaging.	No project-specific packaging is to be used (and observed) in the informal housing sector.	The contractor(s), sub-contractors and their employees are prohibited from taking any project-specific waste for personal use, including but not necessarily limited to, the packaging used for the solar panels.	Applicant / Contractor (SEO & Security).	Following delivery and unpacking of materials.	ECO & IEA.
8.2.9	Illegal dumping will result in the loss of certain land uses like agriculture and conservation and remove natural habitat.	Continued self-sustainability of the site's ecological and agricultural integrity.	Waybills or receipts from the service provider. No evidence of illegal dumping of project-specific waste within the development footprint, no-go	The contractor shall dispose of general waste, that cannot be recycled, at a registered municipal dump site. All waste to be removed to a suitable waste disposal facility by a registered service provider.	Applicant / Operator.	Throughout operation,	IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
			areas or neighbouring properties.				
8.3	**Operational Phase**						
8.3.1	Solid waste can be blown away and into the landscape.	A pristine environment, devoid of wind-blown litter.	No litter or other open sources of waste observed within the fenced premises.	The site will be kept tidy at all times. All waste shall be picked up daily. Maintain good housekeeping tendencies.	Applicant / Operator.	Throughout operation.	SEO / IEA.
8.3.2	Additional waste management impacts associated with recycling of depleted batteries. Battery life is expected to be in the region of 20-years	All waste batteries are disposed of in accordance with regulatory requirements and prevailing industry best practice including but not limited to the South African E-Waste Industry Waste Management Plan (V.1) 2019-2024.	Records of certificates of safe disposal.	The applicant must comply with all regulatory requirements governing the storage, transport and disposal of batteries. Additionally, where an industry battery management best practice is in place, the associated initiatives and practices must be followed and implemented.	Applicant / Operator.	Throughout operation.	SEO / IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
8.4	**Decommissioning Phase**						
8.4.1	The generation of potentially harmful waste that has the potential of contaminating the environment if not disposed at a licensed landfill or, if disposed at an appropriate landfill, reduces the capacity and lifespan of that site.	To minimize waste and ensure suitable disposal at the end of project life.	No evidence of residual structures relating to the project, unless specifically retained at landowner's request.	Properly dispose of all waste & residual structures. All panels must be sent to PV Cycle (including a potential facility in South Africa at time of decommissioning), a European solar panel recycling association, that developed a mechanical and thermal treatment process that achieves a 96 percent recovery rate for silicon-based photovoltaic panels. Soventix undertakes to adhere to prevailing internationally & nationally recognised protocols and procedures for disposal of	Applicant.	At decommissioning phase.	IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				solar PV panels and associated technology. Should the Electronic Waste Association of South African (e-WASA) establish a more stringent protocol regarding the recycling and handling of solar panels, Soventix will comply.			
8.4.2	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.	To ensure that no illegal waste dumps are left in situ following decommissioning.	Restoration of the footprint to a functional ecological and agricultural state.	The illegal dumping or disposal of waste generated from the decommissioning of the Solar PV Plant within the development footprint, no-go areas or on adjacent properties is strictly prohibited. All G6 material must be removed to full depth and all structures, including	Applicant.	At decommissioning phase.	IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				WWTW removed from the Staging Area. All waste must be suitably disposed of.			

TABLE 9. FAUNA & FLORA MANAGEMENT.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
9.1	**Planning & Design Phase (including Pre-Construction)**						
9.1.1	The construction of new service tracks can destroy plants of conservation concern.	To reduce the impacts of roads on fauna & flora.	The successful relocation of plants of conservation concern into suitable habitats.	Prior to the construction of any new roads, a search & rescue must be conducted by a suitably qualified specialist for protected fauna & flora and that of conservation concern; which must then be transplanted outside the works area in a comparative habitat type. Ascertaining similar habitat types may require soil sampling and analysis over and above above-ground similarities.	Applicant / Contractor.	Prior to & during construction.	SEO, ECO & IEA.
9.1.2	Changes in bat community, abundance and activity of bat species.	To reduce impacts on known bat roosting sites and activity areas.	Activities undertaken outside of bat activity and / or roosting sites.	Permanent and temporary construction footprints (including fences) must be designated and positioned away from the bat populations, where possible, as per bat baseline assessment (Cory Toussaint,	Applicant / Contractor.	Prior to & during construction.	SEO, ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				2017) and any subsequent monitoring results. No activities within the Brak River – high bat activity zone (except for pylon construction) and other incidental roosting sites discovered prior to and during construction.			
9.1.3	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.	To construct facilitates in the most sensitive manner to bats and avifauna.	Clear demonstration of adoption of technologies to mitigate impacts on bat and avifauna.	The applicant is to investigate available and updated technologies to mitigate impacts on bats and avifauna, including but not limited to: • Use non-reflective material for the PV panels.	Applicant / Contractor.	Prior to & during construction.	SEO, ECO & IEA.
9.2	**Construction Phase**						

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
9.2.1	Increased risk of alien plant invasion to the detriment of the local ecology and agricultural potential.	To effectively control the invasion of any alien plants.	No new alien plant recruitment (directly or indirectly resulting from construction activities) within the development footprint and neighbouring no-go areas or properties.	Alien invasive vegetation recruitment must be controlled within and along the fence lines of the solar PV footprints. Manual control measures are preferred, but where herbicides are used they must be those endorsed & selective for the target species with the lowest environmental toxicity. Applicant shall collect and destroy all seeds of weed, invader and alien plant species occurring within disturbed and/or rehabilitated areas. Applicant shall immediately uproot, cut or debark weed, invader and alien plant	Applicant / Contractor.	Throughout construction.	SEO, ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				species upon being identified. 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. Recruitment of alien and invasive plants must be controlled to ensure they do not seed and propagate (both declared weeds and those that are outside of their natural distribution).			
9.2.2	Construction activities (i.e. clearing and grading) have the	To reduce in situ losses of protected and conservation	Spatially explicit "Search & Rescue" register indicating the	A search and rescue must be undertaken of any and all footprints that will be temporarily or permanently	Applicant / Contractor. All search & rescue &	Pre-Construction.	ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
	potential to directly impact, that is damage / injure and destroy / kill, local fauna and flora. (The impacts are exacerbated when the species affected are classified as protected, sensitive, rare, or threatened and endangered).	important flora & fauna.	nature & position of all translocated flora & fauna.	affected during construction of the development footprint. All fauna and flora that are protected or of conservation importance must either be cordoned off and protected, or translocated outside of the site establishment and solar PV footprint, into habitats of a similar nature. Avoid direct contact with fauna, through clearing and grading as it can cause injury or death.	translocation activities must be carried out by suitably qualified specialists.		
9.2.3	Harvesting of: - indigenous plants for muthi - firewood; and - poaching of animals.	To ensure no harvesting of natural resources within and adjacent to the development footprint.	Zero incidence of harvesting. All incidences recorded in the incident register including close-out actions.	The harvesting or collection of any natural product(s) from the environment is strictly forbidden. Do not poach or hunt animals within development footprint,	Applicant / Contractor.	Throughout construction & operation.	ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				no-go areas and neighbouring properties. "Problem" animals must be handled with assistance from the provincial conservation authority. With the exception of search and rescue operations authorized by the ECO, no mammal, bird, reptile, invertebrate or fish shall be intentionally caught, hunted or poached, within the development footprint and no-go areas.			
9.2.4	Open excavations and drill holes can trap terrestrial fauna causing	To minimise and potentially eliminate incidental injuries and death through	Zero recorded deaths. All incidents to be recorded in	Borrow pits, excavations and drill holes should as far as possible have smooth slopes, allowing access and exit points to animals,	Applicant / Contractor.	During construction.	ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
	injury or death, including snakes.	open excavations & drilling operations.	incident register, including Corrective Action Reports.	especially when filled with water. Open excavations of any kind should be regularly monitored (daily) for trapped fauna. Drill holes for the solar arrays and fence, and excavations for underground services (i.e. pipes or cables) must not remain open for more than 24 hours. In other words, the excavators, drill rigs or working front must not proceed more than one day ahead of the team(s) that install the infrastructure and backfill. Alternatively, plugs must be placed in drill holes			

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				for the solar array mounts and fencing posts.			
9.3	**Operational Phase**						
9.3.1	Changes in bat community, abundance and activity of bat species.	To minimise deleterious effects on affected bat populations.	No significant deterioration in bat population stability as per specialist monitoring reports.	It is important that areas with low lying depressions where water pools during the autumn and summer rainfall season, are not altered as they may be important areas not only for bats to drink and forage but also for socialising – especially relevant when tying into the ESKOM powerline. A bat specialist must be appointed at the commencement of the operational phase to assess if the mitigations proposed in the EMPr during planning, construction and operation	Applicant / Operator.	Biennial monitoring.	Appointed Bat Specialist.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				are meeting the desired targets and outcomes; and suggest any additional mitigations or amendments based on his / her findings.			
9.3.2	Light pollution during construction and operational phase may alter bat species composition, foraging patterns, reproductive success and predation rate (by creating a preferential habitat for one species at the expense of another).	To reduce impacts on bat populations due to artificial lighting.	No impact in bat population stability & dynamics as per specialist monitoring reports.	The use of lighting at night should be kept to a minimum, so as not to unnecessarily attract invertebrates to the solar facility and possibly their avian predators, and to minimise disturbance to birds flying over the facility at night. Anthropogenic impacts must be minimized to reduce impacts on nocturnal species, including but not limited to reduced lighting that may influence bat foraging behaviour.	Applicant / Operator.	Throughout operation, but applies to Planning & Design and Construction phases.	IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				Utilise down lighting, with a bulb type that has a lower insect attractant value.			
9.3.3	Electric fences can cause death or injury to mammals.	To eliminate death & injury to mammals (wild & livestock) through electrification of fences.	No electrocution induced deaths of mammals.	Ensure electric strands are only installed along the top of the fenceline to mitigate unauthorised human access to the area, without posing a threat to fauna. Fencing options must be utilised that provide adequate security to the plant, but will not result in animal mortality or require onerous vegetation clearing. ClearvuTM type fencing is preferred over electric fencing.	Applicant / Operator.	Throughout operation, but applies to Planning & Design and Construction phases.	IEA.
9.3.4	Potential loss of land use and / or agricultural	To maintain access to the development	Grazing of livestock within the calculated	Allow the landowners sheep to access the fenced-off footprint at the calculated	Applicant / Operator / Landowner.	Throughout operation.	Qualified Ecologist & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
	potential to the farmer and biological functioning.	footprint for livestock as a natural vegetation management tool.	grazing capacity & return periods. Visible signs of grazing, i.e. droppings as a form of verification that grazing access to the landowner is being maintained.	grazing capacity (see Grazing Capacity report by F. de Wet, 2017) and return periods. The Applicant / Landowner are to keep a written record of the dates and stocking densities when grazing is undertaken within the development footprint. The record / register can be kept at the security gate / entrance.		Triennial assessments to refine Grazing Capacity calculations.	
9.3.5	Parking and driving carelessly can increase collisions with mammals, birds, reptiles, amphibians and insects – road kills.	To reduce the incidence of accidental road kills.	A record of registered road kills that (1) accurately reflects the number of observations made or the	Designate parking areas in order to protect local flora and fauna. All road kills within the development footprint and directly adjacent properties must be recorded to monitor	Applicant / Operator.	Throughout Construction & Operation - daily	IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
			number given during interviews undertaken by the auditor, and (2) is less than one incident per month.	and target a decreasing trend aiming for zero incidence. Driving is to be limited around the development at dawn and dusk, when nocturnal or crepuscular creatures are more active.			
9.3.6	The associated overhead power lines will pose a risk to avifauna susceptible to collisions and electrocution.	To minimise power line induced avifauna mortality.	No power line induced mortality, and any mortalities recorded in operational phase mortality reports.	Bird kills as a consequence of overhead powerlines, substation or solar panel collision, must be reported to the developer immediately, and corrective actions implemented to mitigate & remedy the casual factors. Active monitoring for avifauna mortalities underneath the powerlines must be undertaken.	Applicant / Operator.	Throughout Operation. Monitor avifauna mortalities: • **Summe**r: bi-weekly; • **Winter**: weekly.	IEA & Avifauna Specialist (inputs for corrective actions and remedies).

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				All powerlines within the project development area, and the loop-in, loop-out powerlines, must have bird flappers installed to reduce collision and electrocution risk.			
9.3.7	Potential collisions with panels by avifauna and bats.	To reduce avifauna & bat collisions with the solar PV panels.	No panel induced mortality, and any mortalities recorded in operational phase mortality reports.	All incidents of collision with panels should be recorded as meticulously as possible, including data related to the species involved, the exact location of collisions within the facility, and suspected cause of death. Operational Phase monitoring with the aid of video surveillance should be considered, as this will contribute towards understanding bird	Applicant / Operator.	Throughout Operation.	IEA & Avifauna & Bat Specialist (inputs for corrective actions and remedies).

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				interactions with solar panels. It has been suggested by Visser (2016) that collision mortality could be reduced at solar facilities by using 28 cm-spaced contrasting bands or 10 cm spatial gaps between solar panels. This enables birds, particularly waterbirds, to differentiate the expansive layout of panels as a solid structure, reducing the likelihood that they may try to land and collide with the panels. These recommendations should therefore be incorporated into new solar facilities until further research into panel			

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				design and layout suggests otherwise.			
9.3.8	Disturbance to or destruction of roosting & nesting sites.	An uninterrupted breeding season for the avifauna.	The effective control of incidental bird breeding sites with the least impact to the affected birds during the breeding season, and then the prevention of future disturbances.	If birds are nesting on the infrastructure of the facility and cannot be tolerated due to operational risks of fire, electrical short, soiling of panels or other problems, birds should be prevented from accessing nesting sites by using mesh or other manner of excluding them. Birds should not be shot, poisoned or harmed as this is not an effective control method and has negative ecological consequences. Birds already with eggs and chicks should be allowed to	Applicant / Operator through appointed avifauna specialist.	Throughout construction & operation.	IEA & Avifauna Specialist.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				fledge their chicks before nests are removed. If there are any persistent problems with avifauna, then an avifaunal specialist should be consulted for advice on further mitigation.			
9.4	**Decommissioning Phase**						
9.4.1	Impacts on biological functioning and productivity of vegetation.	To ensure restoration of ecological function following decommissioning.	No degraded areas within the decommissioned footprint.	Reinstate ecological function by recreating an open system by removing all project related fencing. The Applicant is to rehabilitate the site after decommissioning in accordance with conditions in 9.2.4 and 9.3.4 of this EMPr.	Applicant / Landowner.	At completion of decommissioning activities	IEA.
9.4.2	Alien Plant Invasion Risk.	To ensure no residual alien plants at	Zero incidence of alien plants within the	The rehabilitated servitudes shall be monitored following the completion of	Applicant / Landowner.	At completion of decommissioning activities, within	IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
		cessation of operations.	decommissioned footprint.	decommissioning of the Solar PV plant for the recruitment and subsequent control of weed, invader and alien plant species, in accordance with Appendix 1 of this EMPr. Following the layered reinstatement of subsoil and topsoil at the Staging Area, seeding of the disturbed footprint must make use of indigenous, locally-occurring species. Additionally, the footprint should be covered with a light mulch e.g. loosely distributed hay bales, to create a suitable microclimate for recruitment. Constant monitoring must be undertaken for the		the growth season, as well as the following growth season following decommissioning.	

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				recruitment of alien invasive vegetation and suitable controls implemented.			

TABLE 10. WATER USE & MANAGEMENT (INCLUDING WATERCOURSES).

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
10.1	**Planning & Design Phase (including Pre-Construction)**						
10.1.1	Impact on riparian vegetation by permanent footprints.	Ensure all development is outside the riparian zone of affected watercourses.	Layout plans indicate development footprint is at least 100m outside of any watercourses. Observation of surveyor pegs outside the 100m watercourse buffer zones (the 100m buffer zone is included in Figure 3 of EMPr).	The development layout plan or drawings to be used by the surveyor and contractor must clearly show the site-co-ordinates of the development footprints relative to and outside of the identified no-go areas, including the 100m buffer zones alongside the watercourses. The development footprint (including fence poles) must me designated and clearly demarcated on the	Applicant / EAP / Design Engineer / Contractor.	At time of design & pre-construction.	Compliance to be established by surveyor and verified by ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				construction site layout plan and on the ground. Provide the appointed Design Engineer and Surveyor with accurate coordinates of the Brak River and other potentially affected watercourses as well as the footprint boundary, to determine buffer extent.			
10.1.2	Decrease in water quality of watercourses.	To minimise the risk of impacts to water resources in and around the project footprint.	No high-risk activities located within close proximity to water resources.	Avoid placing high risk (pollution generating) activities within close proximity to a watercourse as they can cause water pollution.	Applicant / Contractor.	During site establishment & throughout construction.	SECO, ECO & IEA.
10.1.3	Uncontrolled and unsustainable abstraction from a watercourse or aquifer (borehole) and depletion of	Utilisation of borehole water within the sustainable yield of the	Implementation of a register recording static head of borehole against "control" boreholes	The static head of the borehole must be measured to ensure the resource is not being depleted (taking cognisance of seasonal	Applicant / Contractor / Land owner	Prior to and on a monthly basis throughout construction.	SECO, ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
	already constrained groundwater resource.	groundwater resource.	elsewhere on the property. Provision of adequate storage of water allowing for abstraction rates within sustainable yield of borehole / s.	variability and comparative "control" borehole levels – will also require ongoing monitoring). Adequate storage of water must be provided, to allow for suitable abstraction rates that will not exceed the borehole recharge rate throughout the construction process. Adequate storage will allow a slower abstraction rate, equal to or less than the recharge rate. Water meters must be installed on all			

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				boreholes to ensure that utilisation rates are measured and monitored and do not exceed the permissible limits.			
10.1.4	Increased sedimentation of watercourses.	To ensure no project-induced sedimentation effects.	Layout plans, indicating the alignment and placement of structures and infrastructure, relative to the prevailing slope and watercourses, which will result in the least potential for rill, gully or donga erosion and sedimentation. Zero signs (observations) of sedimentation and erosion, specifically rills, gullies or dongas, resulting from the poor	Layout, alignments and design (including poor alignment) of structures and roads should not influence or redistribute surface water flow patterns, increase runoff, cause erosion and/or sedimentation of aquatic habitats. Layout plans must include contour lines to determine whether, particularly, linear infrastructure is poorly	Applicant / Contractor.	Prior to and on a monthly basis throughout construction.	SECO, ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
			alignment of infrastructure and redistribution of surface water runoff into concentrated channels.	aligned and poses a high risk for redistributing or channelling surface water runoff into watercourses.			
10.2	**Construction Phase**						
10.2.1	Increased sedimentation of watercourses.	No sedimentation of water resources due to construction of project.	No evidence of sedimentation of water resources linked to construction activities.	Ensure that water laden with silt does not exit excavations and cause sedimentation of aquatic and / or terrestrial systems. Storm water must be well managed (in accordance with appended Storm Water Management Plan compiled by Jones & Wagener – October 2017) to avoid erosion and resultant export of in	Applicant / Contractor.	Throughout construction.	SECO, ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				situ soil, into watercourses. Ensure that rainfall does not wash soil from stockpiles and windrows into a watercourse and cause sedimentation. Where additional gravel is installed on existing road surfaces, and such improvements raise the resulting road surface above surrounding ground levels, pipes and/or other suitable conduits must be installed to reduce impeding surface water flows and limiting aquatic biota movement. These structures will accommodate the			

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				pressure of the traffic but will also allow for the passage of water when there is flow during the rainy season and medium-sized fish (mudfish or yellowfish) will be able to pass through. Where additional gravel is installed on existing road surfaces, the same must be suitably compacted and stabilised to reduce erosion. The permanent channel may require rocks/stones at the road/water interface to reduce erosion potential. Maintain all access routes and roads			

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				adequately in order to minimise erosion and undue surface damage. Repair rutting and potholing and maintain stormwater control mechanisms. Regularly remove topsoil (and other material) accumulated inside drains of roadways to keep these open and functional. Runoff from roads must be managed to avoid erosion and pollution problems. Following the completion of any road upgrade works the water user must ensure that all disturbed areas are:			

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				(i) cleared of construction debris and other blockages; (ii) cleared of alien invasive vegetation; (iii) reshaped to free - draining and non - erosive contours, and (iv) re-vegetated with indigenous and endemic vegetation suitable to the area. During implementation of the road upgrades, the water user must ensure that the hydrological functionality and integrity of the watercourse, including its bed, banks, riparian habitat and aquatic biota is maintained.			

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
10.2.2	Excessive abstraction from a watercourse or aquifer.	To reduce water usage for construction activities.	Evidence of dust control additives used to minimise water usage for dust suppression activities, including completed logbooks and no evidence of over wetting, i.e. erosion or pools of water (puddles).	An environmentally friendly water-soluble dust control additive / binder must be added as an additive to the water used for dust suppression. The additives generally assist with surface stabilization thereby significantly reducing water usage. All water bowsers must maintain logbooks in which quantities used for construction and dust suppression are recorded. Water bowsers implementing dust	Applicant / Contractor.	Throughout construction.	SECO, ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				suppression, must determine optimal rates of application to ensure over-wetting does not occur.			
10.2.3	Decrease in water quality of water resources.	To minimise the risk of water contamination and activities that impact negatively on water quality.	All high-risk activities to be located at least 100m away from any water resource (surface or ground).	Chemical toilets shall be located in the shade, at least 100m from any watercourse. Re-fuelling with a mobile fuel bowser shall take place outside any watercourse.	Applicant / Contractor.	Throughout construction.	SECO, ECO & IEA.
10.2.4	Impediments to surface water runoff.	To retain as far as possible surface water hydrology.	Limited diversion or impediment to surface water runoff.	The foundational footings provided for the BESS & GENSETS containers must allow for unimpeded stormwater runoff e.g. containers to be positioned on concrete plinths.	Applicant / Contractor.	At commencement of construction.	SEO, ECO, IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				Ensure suitable measures are installed when rehabilitating the Staging Area to mitigate uncontrolled stormwater runoff until vegetation has satisfactorily recruited, including diversion berms, haybale/silt curtains etc. Refrain from removing any natural material or structures from the riverine environment, such as rocks, stones, grit, sand, gravel, dead trees or tree trunks. These components act as natural habitat for the ecosystem.			
10.3	**Operational Phase**						

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
10.3.1	Impediments to surface water runoff.	To retain as far as possible surface water hydrology.	Limited signs of erosion along or resulting from the fence line.	Fence lines must be regularly cleared of accumulating debris (accumulating debri does not refer to living plants, otherwise the removal of plants will cause more erosion), to allow surface water to flow uninhibited across the development footprint.	Applicant / Operator.	Throughout operation.	IEA.
10.3.2	The excessive and / or wasteful use of water has the potential to reduce the ecological reserve required for sustaining the local ecosystem.'	To use water in a manner that is ecologically sustainable and not wasteful.	No drips, leaks or other evidence of wasteful water use.	Water leaks shall be repaired immediately upon being found. Water-saving showerheads shall be used, where relevant. Place a cistern displacement device in the toilet cistern.	Applicant / Operator.	Throughout operation.	IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				Educate employees on the importance and practices of water efficiency. If practical, consider harvesting rainwater from drainpipes. Use an aerator and / or a water flow-reducing spout on the taps and shower heads.			
10.3.3	Poor water quality can be a health risk or harmful to humans and animals.	To ensure safe potable water for employees and livestock.	Compliance of potable water to SANS 241 standard.	Water used for potable (drinking) purposes must be tested to ensure compliance with the minimum standards. Should elements of the water not comply, the water must be treated to ensure no acute or chronic health risks.	Applicant / Operator.	Quarterly.	IEA.
There are no significant decommissioning related impacts expected.							

TABLE 11. AIR QUALITY MANAGEMENT.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
11.1	**Planning & Design Phase (including Pre-Construction)**						
No pre-construction impacts associated with this phase.							
11.2	**Construction Phase**						
11.2.1	Old and poorly maintained vehicles cause the most air pollution from cars, specifically GHG emissions that are released to the atmosphere, contributing to global warming and acid rain.	To reduce the level of car or other combustion-related pollutants entering the atmosphere (by keeping well-maintained plant and equipment).	Evidence of servicing at required intervals. No visible evidence of excessive emissions.	Construction plant and equipment shall be kept in a good state of repair to reduce combustion-related emissions.	Applicant / Contractor.	During construction.	Plant Manager, SEO, ECO & IEA.
11.2.2	Negative effects on floral photosynthetic functioning and potential increase in breathing ailments of site staff, surrounding landowners,	To manage dust entrainment on access roads which may not exceed the thresholds stipulated in the National Dust	Full compliance with National Dust Regulations. Acceptable Dust fallout	Effective implementation of the National Dust Control Regulations. Excessive vehicle movement, and the transport and off-loading of dispersive materials shall be avoided during windy conditions, unless additional dust suppression	Applicant / Contractor.	During construction, monthly.	Monitoring of dust fallout to be undertaken by a professional service provider and compliance to

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
	communities and fauna.	Control Regulations.	rate ($mg/m^2/day$): Residential area < 600 Non-residential area < 1200 Exceedance not more than twice in a year, not sequential months.	methods will ensure that the dust fallout does not exceed the acceptable limits. We suggest that the contractor take into consideration predicted wind speeds from the local weather station when planning construction-related activities with a high risk of generating dust. Dust suppressant must be prioritised for the drilling activities.			be verified by ECO & IEA.
11.2.3	Safety risks and road accidents due to reduced visibility.	To reduce vehicular accidents due to poor dust-induced visibility.	Full compliance with National Dust Regulations.	Dust suppression must be carried out on access roads where high dust entrainment is evident.	Applicant / Contractor.	During construction. Dust fallout evaluation monthly and dust suppression as conditions dictate.	Monitoring of dust fallout to be undertaken by a professional service provider and compliance to be verified by ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
11.2.4	Unpleasant odours.	To reduce unpleasant odours often associated with ablution facilities.	Records of regular servicing, and daily cleaning log.	Chemical toilets shall be kept hygienic and cleaned daily to avoid unpleasant odours. Containerised NewGen WWTW should be utilised during construction to reduce potential air & effluent emissions as well as soil contamination risks associated with sewage spills.	Applicant / Contractor.	During construction.	SEO, HSO, ECO & IEA.
11.3	**Operational Phase**						
11.3.1	Decrease in air quality.	To manage dust entrainment on access roads which may not exceed the thresholds stipulated in the National Dust Control Regulations.	Full compliance with National Dust Regulations.	Effective implementation of Dust Control Regulations. Dust suppression must be carried out on access roads to minimise operational dust emissions.	Applicant / Operator.	As required to minimise dust emissions.	IEA.
11.3.2	The generation of emissions (GHG & Noise) from the	Combustion emissions and noise must be	No excessive smoke and noise must be	No excessive smoke emissions (other than at initial start-up).	Applicant / Contractor.	Frequency of monitoring as stipulated in	SEO or appointed specialist

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
	GEN-SET when augmenting the PV production.	within acceptable limits.	within the permissible limits of (SANS) Standard 10103:2008 and the ECA Noise Control Regulations (see condition 7.2.2 for full reference).	Demonstration of compliance with the relevant limits during active operation of the generators (including initial commissioning).		relevant regulation and standard, as amended from time to time.	service provider. Verification to be done by ECO & IEA.
There are no significant impacts anticipated during the decommissioning phase.							

TABLE 12. SOIL MANAGEMENT.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
12.1	**Planning & Design Phase**						
12.1.1	Loss of valuable topsoil.	To minimise disturbance & contamination of topsoil.	Compliance with site layout plans.	Clearing, and the location of topsoil stockpiles and / or windrows, shall take place in pre-authorised and clearly defined areas only.	Applicant / Contractor.	Prior to and during construction.	ECO & IEA.
12.2	**Construction Phase**						
12.2.1	Decline in soil organisms.	To maintain the biological integrity of disturbed soil.	The list of plant species, and their relative abundancies, chosen for rehabilitation reflects the natural plant communities that need to be rehabilitated.'	Seed disturbed areas after construction with grass seeds of the naturally occurring plant species to encourage invertebrate species richness.	Applicant / Contractor (SEO).	Following construction or construction induced disturbance.	ECO & IEA.
12.2.2	Loss of valuable topsoil.	To retain all disturbed and cleared topsoil.	Comparative quantification of cleared and reinstated topsoil volumes.	Any topsoil removed during the establishment of parking areas, temporary roads, or any other cleared areas, must be protected from vehicular and construction impacts.	Applicant / Contractor (SEO).	During initial clearing and prior to reinstatement of topsoil.	ECO & IEA.

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No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				Do not mix topsoil with cement and / or subsoil or let it be pulverised by trucks.			
12.2.3	Potential sterilisation of the soil.	To maintain soil viability.	Use of only selective, environmentally friendly herbicides.	Where possible, refrain from using non-selective herbicides to control vegetation, depending on the active ingredient, it can sterilise the soil. Application of herbicides may only be applied by or under the supervision of a Certified Pest Control Officer.	Applicant / Contractor (SEO).	Every treatment episode.	ECO & IEA.
12.2.4	Soil contamination.	To reduce and avoid soil contamination.	No evidence of contaminating activities on unprotected ground, or in the case of accidental spills, documented evidence of	Construction plant and equipment shall be kept in a good state of repair to reduce hydrocarbon leakages. Ensure vehicles are assigned daily check lists including checks for leaks. Any leaks must be attended to as a matter of urgency. All transport/heavy vehicles standing	Applicant / Contractor (SEO).	During construction.	ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
			rapid remediation.	for prolonged periods need to have suitably sized (surface area and storage capacity) drip trays installed beneath the vehicles. Spill kits must be available at the Staging Area for accidental spillages. No servicing of vehicles permitted, and emergency breakdowns must use containment measures to avoid spills. All recovered hydrocarbons must be stored for recycling and contaminated soil placed in containers within a bunded storeroom. 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,			

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				onsite treatment of contaminated soil should be considered with and / or in consultation with a registered hazardous waste management company. Soil horizons must be stockpiled or windrowed separately during excavation to ensure they can be reinstated in reverse order and ensure restored soil structure. Staging area will require a layer of compacted G6 material to create stability for off-loading of heavy equipment which must be limited to key offloading areas. Topsoil & subsoil must be removed (and stockpiled separately) at the Staging Area, to avoid contamination with G6			

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				material and allow for reverse order reinstatement during rehabilitation) to the required depth of G6 fill, to ensure natural ground level is retained resulting in limited impediment to stormwater runoff. Compaction of G6 material over time and resultant subsistence may result in pooling of stormwater, and additional G6 may be required to create level ground. The above-ground storage of fuel must be suitably bunded to 110% of its content and covered with a roof to avoid rainwater ingress.			
12.2.5	Soil erosion, soil loss & associated degradation of ecosystems.	To reduce erosion induced soil losses and consequential ecosystem degradation.	To record all areas prone and affected by erosion and implement	Areas disturbed and rehabilitated during construction shall be monitored for signs of erosion and if found to occur, immediately	Applicant / Contractor (SEO).	During construction.	ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
			suitable pre-emptive and remedial measures.	corrected ('source') and repaired ('symptom'). 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. 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. Ensure a quick and adequate cover with indigenous and local grass species on all PV Solar Plant servitudes.			

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				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. Grading of existing farm roads must not be promoted, but farm tracks must be utilised as far as possible. Sediment traps may be necessary to prevent erosion and soil movement if there are topsoil or other waste heaps present during the wet season. The Contractor shall monitor the rehabilitated servitudes for the duration of the contract defects			

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				and liability period for signs of erosion.			
There are no significant impacts expected during the operational and decommissioning phases.							

TABLE 13. SOCIAL-ECONOMIC MANAGEMENT (HEALTH, SAFETY & SECURITY & COMMUNICATION).

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
13.1	**Planning & Design Phase (including Pre-Construction)**						
13.1.1	Concerns about social disturbance and community safety (including loitering at construction site).	To reduce human induced impacts and nuisance factors.	No complaints from affected parties in the on-site complaints register. Where complaints are lodged effective and timeous close-out must be demonstrated.	Adequate accommodation and transport must be provided for all staff to reduce impact on the property owner and adjacent farms as well as relieving pressure off road networks.	Applicant / Contractor (via CLO and SO).	Prior to and during construction and operation.	ECO & IEA
13.1.2	Community confusion, frustration & lack of information.	To avoid creating false hope where job creation opportunities are concerned.	Development of an effective job seeker database.	Implementation of a community relations strategy until all activities on site cease and rehabilitation is completed. Develop a job seeker database, or integrate with an existing service provider in the adjacent	Applicant / Contractor / Operator	Prior to and during construction and operation.	ECO & IEA

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				towns, to ensure job seekers' details are captured. As positions become available, this database can be searched for suitable skills within the local populous before positions are outsourced. These measures will reduce the potential nuisance factor to the land owner, caused by job seekers reverting to visiting the proposed site of development. Following awarding of Preferred Bidder Status, formalised commitments must be made to socio-economic initiatives that will benefit surrounding communities, including the compilation of a Detailed Labour Plan which must include details pertaining to skills development opportunities especially for the Youth and			

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				Women, bursary opportunities / learnerships and other educational facilities in the municipal area. The Plan must be supplied to the Local Municipality.			
13.2	**Construction & Operation Phase**						
13.2.1	Increase in crime including damage to farm infrastructure and vandalism.	Reduce impacts associated with crime.	No perpetuating criminal activity. Improvements to security must be demonstrated following an incident.	Security must be appointed throughout construction & operation phases to discourage criminal elements from site.	Applicant / Contractor / Operator.	At commencement of construction, especially site establishment and during operation.	ECO & IEA.
13.2.2	Potential social pathologies (social unrest).	Reduce impacts associated with disgruntled staff.	No strike actions by staff. Improvements to engagement with staff must be demonstrated	Ensure effective communication and engagement with staff and surrounding community via inter alia the appointment of a suitably qualified CLO. Transparent communication through the right channels to	Applicant / Contractor / Operator (CLO).	At commencement of construction, and during operation.	ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
			following an incident.	communicate with the community as to when and how their contracts will come to an end.			
13.2.3	Injury to site staff from construction, demolition and blasting activities.	To ensure effective Health & Safety implementation.	Appointment of a suitably qualified HSO and compliance monitoring against the OHSA (Act 85 of 1993).	Implement a safety plan, access protocols, grievance mechanism and compensation policy. All staff must undergo a site induction that outlines the socio-environmental constraints of the site.	Applicant / Contractor (HSO) / Operator.	Throughout Construction & Operation.	Health & Safety Audits biannually.
13.2.4	Injury to trespassers resulting in possible lawsuits.	To avoid inadvertent injuries to trespassers.	No recorded injuries to trespassers.	Increase security to protect trespassers from being electrocuted. Keep lighting on at night and increasing security will help improve security to prevent unauthorised access. Adequate signage must be placed around the development warning uninformed people of the potential	Applicant / Contractor.	Throughout construction	ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				hazards and dangers associated with the project.			
13.2.5	Negative effects on the wellbeing of the local inhabitants and site staff as well as the potential outbreak of disease (including HIV/AIDS).	To avoid negative impacts on the health of the local residents and occupiers.	Effective implementation of awareness training including measures to assess effectiveness of training.	AIDS / HIV awareness training must be undertaken to ensure that the labour force is well informed on the matter. Dangerous fumes, noise, dust and water impacts must be avoided that may affect both the labour force and surrounding landowners and users.	Applicant / Contractor / Operator	Ongoing	ECO & IEA.
13.2.6	Potential increase in pedestrian and livestock accidents.	To reduce impacts and injuries to pedestrian and livestock.	No injuries recorded in incident register. Close-out Reports must demonstrate improvements to avert a recurrence.	An awareness must be fostered to drive carefully in order to avoid killing or injuring people or animals and damage to property. Open borrow pits, excavation and quarries must be fenced-off and / or demarcated when construction activities are taking place, to ensure the safety of unsuspecting public or job seekers and animals.	Applicant / Contractor / Operator.	Ongoing awareness and following cessation of use of borrow pits.	ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				Open excavations must be secure and cordoned off to avoid accidental injury to humans and animals alike.			
13.3	**Decommissioning Phase**						
13.3.1	Increased unemployment after construction & operation ends.	To minimize the negative social impacts at the end of each phase of the project.	Develop & effective implementation of an Exit Strategy.	Develop and implement a holistic Exit Strategy that adequately and timeously communicates and buffers staff lay-offs and mitigates losses in employment and income through formalised and structured skills development programmes. Clearly make the terms and conditions of employment known to all employees (temporary & permanent) including anticipated duration of each phase.	Applicant.	Prior to commencement of construction.	ECO & IEA.

TABLE 14. CULTURAL, HERITAGE, ARCHAEOLOGICAL & PALEONTOLOGICAL MANAGEMENT.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
14.1	**Planning & Design Phase (including Pre-Construction)**						
14.1.1	Surveying and pegging of temporary footprints can disturb sites of historical significance, i.e. Graves.	To ensure initial survey & clearing activities do not disturb know heritage sites.	All graves and know heritage sites are secure (fenced or cordoned-off)	Ensure that none of the layout & designs of permanent footprints will disturb sites of historical significance, including graves. All formal and informal cemeteries and burials must be left *in situ* and not be disturbed. Should it not be possible to avoid sites protected in terms of section 35 of the NHRA, permits in terms of section 35 of the NHRA and Chapter II and IV of the NHRA Regulations will need to be applied for from SAHRA. No mitigation work may commence on these sites without a permit issued in this regard. Mitigation such as on-site relocation of the possible rock engravings must be	Applicant.	Prior to surveying.	ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				considered or donation to a repository for long term curation, with destruction as a last resort. Of the two paleontoligy sites identified, only one is within the approved development footprint, albeit on the very edge, which should be suitably cordoned-off and clearly reflected on the Master Layout Map. A Phase 2 Heritage Impact Assessment must be undertaken to manage all identified *in-situ* heritage resources, including all medium-high and high significance heritage resources in order to compile a Heritage			

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				Management Plan, prior to commencement, for the management of these resources during project development & operation. The HMP must be submitted to SAHRA prior to the construction phase for comment. No construction activities may occur without comments from SAHRA in this regard.			
14.1.2	Lack of awareness of heritage resources.	To promote awareness about heritage resources and their presence within the development area.	Heritage content in site induction and toolbox and awareness talks.	Include an awareness of heritage resources in the environmental induction. Categories of heritage resources include, inter alia: • Evidence of archaeological sites or remains include remnants of stone-made structures, indigenous ceramics, bones, stone artifacts, ostrich eggshell	Applicant / Contractor.	Throughout construction.	ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				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 viewscapes, • Burial grounds, unmarked human burials, graves of victims of conflict, and/or graves older than 60 years, • Structures older than 60 years, • Fossils, etc.			
14.2	**Construction Phase**						
14.2.1	Loss of archaeological & palaeontological valuable artefacts.	To ensure construction activities do not disturb know or incidental heritage sites.	No loss of archaeological valuable artefacts. All known "heritage" sites	All areas of heritage value must be demarcated and avoided. Construction must be undertaken in accordance with the developed Heritage Management Plan.	Applicant / Contractor.	Throughout construction.	ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
			within the development footprint is suitably cordoned off.	Incidental discoveries during clearing and grubbing must be disclosed to site management with immediate cessation of activities until their significance can be assessed by a qualified heritage specialist. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule. Any archaeological artefacts unearthed during excavations			

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				must be protected and left in situ. Works must cease until the significance of the finding can be assessed by a qualified archaeological specialist.			
14.2.2	Loss of cultural and heritage value to society.	To ensure correct procedures are followed following chance finds to preserve the heritage resource.	Adherence to protocols specified in management actions following a chance find.	If heritage resources are uncovered during the course of the development, a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the heritage resource. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA. If any evidence of archaeological sites or remains (e.g. remnants of stone-made	Applicant / Contractor.	Throughout construction.	ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted as per section 35(3) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule.			
14.2.3	Disturbance, destruction or damage to fossils preserved at or below surface through surface clearance and	Avoidance of palaeontologically sensitive areas (riverine alluvium).	Older (orange-brown) consolidated alluvial deposits along major water courses (e.g. Brakrivier) –	Ongoing monitoring for chance fossil finds within development footprint during construction phase. The older consolidated fluvial deposits along the Brakrivier	ECO Developer to appoint palaeontologist following	Ongoing during construction phase.	Compliance to be verified by ECO.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
	excavations during construction phase.	Reporting of chance fossil finds to SAHRA.	see area outlined in blue in Fig. 30. in Paleontology Assessment (Almond, 2017).	be avoided during construction since they do contain fossil wood. Substantial fossils (vertebrate bones, teeth, large blocks of petrified wood) to be safeguarded, preferably in situ, and reported to SAHRA for recording and sampling by professional palaeontologist. The ECO responsible for the construction phase of the project should be aware of the potential for important new fossil finds – such as vertebrate bones and teeth, or petrified logs - and the necessity to conserve them for possible professional mitigation.	significant new fossil finds.		

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				The ECO should monitor all site clearance and substantial excavations into sedimentary rocks for fossil remains on an on-going basis during the construction phase. Recommended mitigation of chance fossil finds involves safeguarding of the fossils (preferably *in situ*) by the responsible ECO and reporting of finds to SAHRA for the Northern Cape (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Phone: +27 (0)21 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za).			

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				Where appropriate, judicious sampling and recording of fossil material and associated geological data by a qualified palaeontologist, appointed by the developer, may be necessary, under a Fossil Collection Permit issued by the relevant heritage Resources authority (SAHRA). Any fossil material collected should be curated within an approved repository (museum / university fossil collection) by a qualified palaeontologist.			
14.3	**Operational & Decommissioning Phases**						
14.3.1	Operations & decommissioning activities pose the risk of not complying with the	Full compliance with the Heritage Management Plan (HMP).	Operational audits and decommissioning plans provide verifiable	Operation & decommissioning activities must be undertaken in accordance with the provisions of the developed Heritage Management Plan.	Applicant.	Throughout operations and at decommissioning.	SEO, IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
	provisions of the Heritage Management Plan.		evidence of compliance with the HMP.				

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<table>
<tr><th colspan="3">Table 14.4. CHANCE FOSSIL FINDS PROCEDURE: SOVENTIX SOLAR PV PROJECT ON VARIOUS FARMS, NEAR HANOVER</th></tr>
<tr><td>Province & region:</td><td colspan="2">PIXLEY KA SEME DISTRICT, NORTHERN CAPE</td></tr>
<tr><td>Responsible Heritage Management Authority</td><td colspan="2">SAHRA, P.O. Box 4637, Cape Town 8000.
Contact: Dr Ragna Redelstorff. Tel: 021 202 8651. Email: rredelstorff@sahra.org.za
or Ms Natasha Higgitt. Tel: 021 462 4502. Email: nhiggitt@sahra.org.za</td></tr>
<tr><td>Rock unit(s)</td><td colspan="2">Adelaide Subgroup (Lower Beaufort Group), Pleistocene alluvium</td></tr>
<tr><td>Potential fossils</td><td colspan="2">Vertebrate bones & teeth, vertebrate and other burrows, plant compressions, petrified wood</td></tr>
<tr><td rowspan="3">ECO protocol</td><td colspan="2">1. Once alerted to fossil occurrence(s): alert site foreman, stop work in area immediately (N.B. safety first!), safeguard site with security tape / fence / sand bags if necessary.</td></tr>
<tr><td colspan="2">2. Record key data while fossil remains are still in situ:
• Accurate geographic location – describe and mark on site map / 1: 50 000 map / satellite image / aerial photo
• Context – describe position of fossils within stratigraphy (rock layering), depth below surface
• Photograph fossil(s) in situ with scale, from different angles, including images showing context (e.g. rock layering)</td></tr>
<tr><td>3. If feasible to leave fossils in situ:
• Alert Heritage Management Authority and project palaeontologist (if any) who will advise on any necessary mitigation
• Ensure fossil site remains safeguarded until clearance</td><td>3. If not feasible to leave fossils in situ (emergency procedure only):
• Carefully remove fossils, as far as possible still enclosed within the original sedimentary matrix (e.g. entire block of fossiliferous rock)
• Photograph fossils against a plain, level background, with scale
• Carefully wrap fossils in several layers of newspaper / tissue paper / plastic bags</td></tr>
</table>

	is given by the Heritage Management Authority for work to resume	• Safeguard fossils together with locality and collection data (including collector and date) in a box in a safe place for examination by a palaeontologist • Alert Heritage Management Authority and project palaeontologist (if any) who will advise on any necessary mitigation
	4. If required by Heritage Management Authority, ensure that a suitably qualified specialist palaeontologist is appointed as soon as possible by the developer.	
	5. Implement any further mitigation measures proposed by the palaeontologist and Heritage Management Authority	
Specialist palaeontologist	Record, describe and judiciously sample fossil remains together with relevant contextual data (stratigraphy / sedimentology / taphonomy). Ensure that fossils are curated in an approved repository (e.g. museum / university / Council for Geoscience collection) together with full collection data. Submit Palaeontological Mitigation report to Heritage Management Authority. Adhere to best international practice for palaeontological fieldwork and Heritage Management Authority minimum standards.	

TABLE 15. INFRASTRUCTURAL & TRAFFIC MANAGEMENT (INCLUDING PARKING ON SITE).

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
15.1	**Planning & Design Phase (including Pre-Construction)**						
15.1.1	Decrease in surface quality of access roads.	To ensure the quality and function of unsurfaced roads leading to and from the project area.	Signed MoU with Roads Division of Responsible Municipality.	Consult with the Roads Division of the Responsible Municipality and enter into a Memorandum of Understanding (MoU) outlining costs and responsibilities to be shared by both parties for the ongoing maintenance of affected unsurfaced roads.	Applicant.	Following successful award of tender.	ECO & IEA.
15.2	**Construction & Operation Phase**						
15.2.1	Dust entrainment from unsurfaced roads can result in unacceptably high dust fallout.	To manage dust entrainment on access roads which may not exceed the thresholds stipulated in the National Dust Control Regulations.	Full compliance with National Dust Regulations. Acceptable Dust fallout rate ($mg/m^2/day$): Residential area < 600 Non-residential area < 1200	Dust suppression must be carried out on access roads where high dust entrainment is evident. To reduce water usage, a suitable soil binder must be used in dust suppression activities. Excessive water usage to control dust on dirt roads can cause erosion and lead to hazardous conditions for road users.	Applicant / Contractor.	During construction, monthly.	Monitoring of dust fallout to be undertaken by a professional service provider and compliance to be verified by ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
			Exceedance not more than twice in a year, not sequential months.				
15.2.2	Parking and driving carelessly can increase collisions with mammals, birds, reptiles, amphibians and insects – collectively referred to as "roadkills".	To avoid and minimise impacts from traffic on animals residing on and around the property.	Compliance to speed limits. No recorded project vehicle associated animal mortalities.	Drivers shall adhere to the relevant speed limit(s) (ON the existing road network) at all times and restrict their movements to the existing and / or approved roadway or servitude. The speed limit on the property shall be 40 km/h and 30km/h within the development footprint. A register must be maintained of all animal mortalities recorded on the property and localised access roads.	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.
15.2.3	Contamination from spills when refuelling, parking, driving, emergency repairing, operating	To reduce contamination of soil from leaking plant and vehicles and upon	Spills are removed within 48 hours of event.	Oil & fuel spills on roadways and parking areas must be removed to depth of penetration following their discovery and placed in a	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
	plant or equipment to soil or nearby or within the watercourse.	occurrence is remediated promptly.	Records of servicing by off-site workshop. Drip tray issued to all plant and recorded in a register.	designated hazardous container for safe disposal. Drip trays must be placed under all plant that is parked overnight and extended periods not in operation. Drip trays can be filled with hydrophobic hydrocarbon absorbent material to avoid content being leached out during rainfall events. No servicing or washing of vehicles or plant may take place in parking bays, and all servicing must be done off-site, no service or wash-bays are to be constructed on site. Emergency breakdowns in the parking areas or along roads, must be addressed after adequate pollution containment measures have been implemented including			

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				but not limited to drip trays and spill kits. Refuelling of vehicles and plant may only take place at a designated and permitted (from local Fire Chief) fuel storage tank or mobile fuel bowser, under the guidance of a Specific Operating Procedure (SOP) that limits spillage and addresses remedial actions in the event of a spillage.			
15.2.4	Delivery of the solar panels and the personnel trips will influence the existing traffic operations on the affected roads.	To reduce traffic related impacts from project related activities.	Compliance with EMPr mitigations & Traffic Management Plan (see Appendix 6).	It is anticipated that only the delivery of the solar panels and the personnel trips will influence the existing traffic operations on the affected road. The construction machinery will only have a traffic impact on delivery to and collection from the site and are therefore regarded as negligible.	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				Delivery & collection from the site need to take place in bulk and / or around the same time, in order to minimally affect the existing traffic operations.			
15.3	**Decommissioning Phase**						
There are no significant impacts expected during this phase.							

TABLE 16. VISUAL ASPECT MANAGEMENT.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
16.1	**Planning & Design Phase (including Pre-Construction)**						
There are no significant impacts expected during this phase, as footprint location has already mitigated the planning and design requirements.							
16.2	**Construction & Operational Phase**						
16.2.1	Impact of construction on visual receptors in close proximity to the solar facility, including road users and local homesteads.	To manage the facility in a way that minimised its reflectance impacts on the surrounding environment.	Demonstration of effects to minimise visual impacts.	Use visual screens to minimise the visual impact on the scenic resources of this region. Have minimal placements that can be visually intrusive to sensitive receptors. Utilise fencing options that do not create a significant visual barrier.	Applicant.	Throughout the project lifecycle.	ECO & IEA.
There are no significant impacts expected during the decommissioning phase.							

SECTION 6: ENVIRONMENTAL AWARENESS PLAN

This section of the report is included in compliance with Section 24N(3)(c) of the NEMA and the EIA Regulations (2014) as amended.

The EMPr needs to include, inter alia:
An environmental awareness plan describing the manner in which-
(i) The applicant intends to inform his or her employees of any environmental risk which may result from their work; and
(ii) Risks must be dealt with in order to avoid pollution or the degradation of the environment;

All site staff of all levels, as well as visitors to the site, shall ensure that all of his employees and those of his sub-contractors attend Environmental and Social Awareness Training in order to be made aware of the environmental management requirements for the project in order to promote the effective implementation of the EMPr. This training shall form part of the normal induction process for employees. The Environmental and Social Awareness Training shall be planned to ensure that attendees:
• Acquire a basic understanding of the key environmental features within the project area and its immediate environs;
• Become familiar with the environmental controls required on the project; and

Initial induction training must be undertaken at commencement of employment of any staff member, with provision made for quarterly refresher courses to be undertaken during the course of the Contract where relevant topics, such as emergency response drills, can be communicated. Initial induction training must provide every new employee with a holistic overview and understanding of the project environmental requirements. Inductions must be structured and presented with suitable information relevant to the level and nature of work being performed.

Environmental and social awareness must be further cultured through daily toolbox talks on site, which all relevant staff members are required to attend. Daily topics will create awareness around environmental aspects, impacts & risks associated with employees' tasks & activities and the benefits of enhanced environmental performance and an effective Environmental Management System (EMS) as well as the implications of not conforming with the EMS and project compliance requirements. An Environmental Policy must be formulated and communicated regularly as part of awareness training, as well as being posted on notice boards for ease of reference. A record of all inductions & toolbox talks, and attendees must be kept on file in order to keep track/record of all awareness training undertaken. A Training Matrix must be compiled for various levels of employees, identify gaps in competencies and track/schedule necessary training events. The success of all training must be assessed through suitable mechanisms.

The environmental training plan must at least include cover the following topics:
- The construction activities that will impact both the physical and social environments,
- Mitigation measures put in place to avoid or minimise the anticipated impacts and risks,

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- The nature and appearance of cultural heritage resource sites that may be found during construction activities and the mandatory procedures to be followed,
- Prevention and control of waste, litter, spillages and fire,
- Outline specific environmental management measures, such as rehabilitation of disturbed areas, fire management, water pollution and dust management,
- Significant Environmental Aspects,
- Removal of vegetation during site clearance,
- Animal habitat disturbance due to vegetation clearance and awareness regarding the possible occurrence of sensitive plant and animal species,
- Soil erosion and pollution,
- Soil compaction,
- The presence of animals on site including the protection of landowner's livestock,
- Disturbances to neighbours due to construction noise and traffic; and
- The positive impacts, of the greener technology being implemented, on the biophysical and socio-economic environments.

Environmental awareness training should include and consider the following aspects:

- Environmental awareness training should be undertaken by the Site Environmental Officer and / or health and safety representative of Soventix,
- It is recommended that awareness posters be developed and placed on site in highly visible areas to provide the required information when it needs to be referred to as well as reminding employees of their obligations with regard to environmental protection,
- A slideshow can also be developed for initial awareness induction and for use as a reminder of the environmental risks and responsibilities at the site or induction of future Contractors; and
- Throughout the presentations (posters, meetings, slideshows, etc.), it is recommended that visual aids be used to explain the potential risks and management thereof as thoroughly as possible.

The awareness training for this project should aim to prevent, and where prevention is not possible, mitigate detrimental environmental impacts. It should promote awareness of environmental risks and management thereof. It should furthermore promote green thinking and provide information on alternative energy sources and energy consumption reduction.

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SECTION 7: RESPONSIBILITIES OF ROLE PLAYERS

The approved EMPr shall be printed, completed and kept in an on-site file designated for all matters pertaining to environmental management. Co-operation is required between the applicant, contractor, and ECO to ensure that activities are managed in an amicable and responsible manner and in accordance with the philosophies of environmental legislation and principles of the EMPr.

This EMPr is predominantly compiled for the management of construction & operations associated with the development of a solar PV facility, once the Planning and Authorisation phases are complete. The tabulated management programmes assign responsibilities to one or more role player, the below descriptions identify responsibilities and accountabilities in the case of any uncertainty.

Applicant

The applicant remains ultimately accountable for ensuring that the development is implemented according to the requirements of the EMPr. Although the applicant delegates specific responsibilities to role players to perform functions on his / her behalf, the ultimate accountability cannot be delegated. The developer is responsible for ensuring that sufficient resources (time, financial, man-power, equipment, etc.) are available to the other role players (e.g. the contractor, SECO, etc) to efficiently perform their tasks in terms of the EMPr. The responsibility of restoring the environment in the event of any negligence, which leads to damage of the environment, also falls to the applicant.

The applicant must ensure that the EMPr is included in any documents (tender, appointment etc.) so that any contractor who is appointed is bound to the conditions of the EMPr. The applicant must appoint an independent Environmental Control Officer (ECO) prior to commencement of construction, to help identify pre-construction & construction criteria that need to be fulfilled timeously, to avoid non-compliance with the overarching authorisation conditions and / or legislation.

Contractor

The contractor, as the developer's agent on site, is bound to the EMPr conditions through his / her contract with the developer and is responsible for ensuring that she / he adheres to all the conditions of the EMPr. The contractor shall be responsible for the actions undertaken by all their employees including sub-contractors. The contractor must thoroughly familiarise him / herself with the EMPr requirements before coming onto site and must request clarification on any aspect of these documents, should they be unclear. The contractor must ensure that he / she has provided sufficient budget for complying with all EMPr conditions at the tender / appointment stage.

The contractor must comply with all instruction (whether verbal or written) given by the environmental manager, project manager or site engineer in terms of the EMPr.

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Site Environmental Officer (SEO)

The Site Environmental Officer (SECO) shall be appointed by the contractor to implement the EMPr daily. The SEO shall ensure that all construction activities are carried out in accordance with the relevant conditions of the EMPr, Environmental Authorisation (EA), General Authorisation (GA) or Water Use License (WUL) (under the National Water Act), wayleaves, provincial ordinances & provincial bylaws.

Environmental Control Officer (ECO)

The Environmental Control Officer (ECO) is appointed by the applicant as an independent monitor of the implementation of the EMPr, EA & GA / WUL. He / she must form part of the project team and be involved in all aspects of the project planning that can influence environmental conditions on the site.

The ECO must attend relevant project meetings, conduct inspections to assess compliance with the EMPr, EA & GA / WUL and be responsible for providing feedback on potential environmental problems associated with the development. In addition, the ECO is responsible for:

- Liaising with relevant authorities;
- Liaising with contractors regarding environmental management; and
- Undertaking routine monitoring and appointing a competent person / institution to be responsible for any specialist monitoring (if required).

The ECO has the right to enter the site and undertake monitoring and auditing at any time, subject to compliance with health and safety requirements applicable to the site (wearing safety boots, head gear, mouth mask etc.).

Independent Environmental Auditor (IEA)

An IEA shall be appointed by the Applicant to undertake EMPr, EA & GA / WUL compliance audits at 6-monthly intervals. The purpose of conducting a periodic compliance audit would be to systematically check and evaluate progress on EMPr, EA & GA / WUL implementation. The environmental audit will serve as a 'snapshot' of the environmental situation and progress at a given point in time. The purpose of the audit is to illustrate whether there has been any improvement or change over time.

The IEA will fulfil the auditing requirements by systematically auditing the Project's performance & compliance against the requirements of the EA, EMPr & GA / WUL in a process that is carefully planned, structured and organised. The audit process must, on a sampled basis, track past actions, activities, events, and procedures through using existing documentation, conducting interviews with managers and personnel, and observing practices on site.

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SECTION 8. COMMUNICATION

At least monthly site meetings should be held where feedback can be given and any potential problems identified and remedied. If they cannot be remedied then construction in that area should be stopped, until a suitable remedy is identified.

Monitoring Compliance

Pre-construction, Construction and Post-construction:

The ECO will be responsible for monitoring and reporting on compliance of the activity from pre- to post-construction.

Inspections and resulting compliance reports shall be a systematic, independent and documented process for obtaining compliance evidence and evaluating it objectively to determine the extent to which the compliance criteria are fulfilled. The compliance criteria (or reference) against which the compliance evidence is compared shall include this EMPr, the Environmental Authorisation & General Authorisations or a Water Use License (under then National Water Act).

The ECO must undertake bi-weekly inspections of the site and submit monthly environmental compliance reports to the National Department of Environmental Affairs (DEA) as the competent authority for this project, unless otherwise prescribed in the EA. The compliance reports must identify the actual and potential transgressions, describe the impacts, provide verifiable evidence (photographs, records or statements) and recommend corrective and preventive actions (including completion dates). The compliance reports must measure the applicant / contractor's level of compliance against the aforesaid criteria. Performance scoring / reporting is optional.

The SECO shall maintain an on-site diary to record environmental aspects (elements of the construction activities that can interact with the environment) and environmental impacts (any change to the environment, whether adverse or beneficial, wholly or partially resulting construction activities), daily.

Operation:

The relevant authorities should be responsible for monitoring compliance with aspects of the activity that fall within their jurisdiction.

Time Periods and Failure to Comply with the EMPr

The time periods within which the measures prescribed in this EMPr must be implemented shall be applicable to the full duration of the activity that is being undertaken and mitigated. The time periods within which corrective and preventive actions need to be implemented shall be determined by the SECO and / or ECO, depending on the nature and severity of the finding. In the absence of a prescribed deadline or completion date, findings shall be corrected or prevented immediately upon being found to occur, if practical.

The EMPr is a legally binding document and should form part of the contract. Should there be failure to comply with the EMPr the following steps are envisaged:

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Step 1
The ECO meets with the contractor and points out the deviation from the EMPr. The ECO and Contractor agree on a solution and this non-compliance is recorded by the ECO as well as the solution put forward to rectify it.

Step 2
Should there still be non-compliance or there is a more serious infringement of the EMPr the contractor is informed in writing with a deadline by which the problem must be rectified. Any extra costs that may be accrued must be borne by the contractor.

Step 3
If non-compliance persists, the Chief Resident Engineer (CRE) or Project Manager (PM) shall order the contractor to suspend construction in that specific area or the project as a whole until the activity at variance with the EMPr is corrected and or remedial actions taken. Any cost that occurs as a result of such action shall be for the account of the contractor.

Step4
Where there is non-compliance with the EMPr and no evidence that the contractor intends complying even though the above 3 steps have been taken the applicant may terminate the contract due to non-compliance (breach of contract). Such measures do not replace any legal proceedings that may occur as a result of such non-compliance.

Environmental Awareness Plan
The applicant shall ensure that his project team, contractor and labourers are adequately trained with regard to the implementation of the EMPr, EA & GA / WUL throughout construction.

Pre-construction

Environmental Awareness Inductions shall be targeted at two distinct levels of employment: management (applicant, architect, engineer, contractor / site agent) and labourers (including the site foreman). The SEO shall be responsible for preparing and presenting inductions appropriate to the audience. Inductions shall be undertaken prior to the commencement of construction. Where possible the presentation will be conducted in the language of the employees.

The Environmental induction for management shall include mitigations that are relevant to or require management's involvement prior to implementation including, but not limited to, the following:

- Measures required during the Planning and Design, and Pre-construction phase, and
- Site establishment.

The Environmental induction for the contractor's labourers and foreman shall, as a minimum, include the following:

- A description of the actual and potential environmental impacts,

- Standard operating procedures for undertaking construction activities (i.e. mixing concrete, driving, etc.) that can have an environmental impact,
- Staff conduct including sanitation and movement,
- The integrated waste management strategy,
- The steps to be taken should any item of perceived environmental importance including archaeological artefacts be located or unearthed, and
- The environmental emergency plan.

Construction

The SEO and ECO shall undertake an informal training needs analysis throughout construction to identify appropriate environmental topics and the appropriate labourers to target. The analysis shall be informed by the findings contained in the site diary and compliance reports. Training shall be given during toolbox talks.

The SEO and ECO shall keep records of the environmental inductions and subsequent toolbox talks in an on-site file designated for all matters pertaining to environmental management.

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SECTION 9: ADMINISTRATION OF INCIDENTS

The purpose of the National Environmental Management Act, 107 of 1998 (NEMA) is *inter alia*, to provide for co-operative environmental governance by establishing principles for decision making on matters affecting the environment, and specifically for the control of incidents involving hazardous substances that could have a detrimental impact on the environment. This is a measure to give effect to the provisions of section 24 of the Constitution regarding the protection of the environment.

The Department of Environment Affairs (DEA) accordingly developed a guideline document providing guidance to Relevant Authorities on the administration of section 30 NEMA, which has in turn informed some of the content of this section.

Section 30 of NEMA deals with the reporting of and response to "incidents" and provides for certain statutory duties and responsibilities of the person responsible for the incident (the 'responsible person') and outlines the permissible actions of the 'relevant authority' to which the incident is reported. Section 30 deals with the reporting of and response to *an unexpected, sudden and uncontrolled release of a hazardous substance, including from a major emission, fire or explosion, that causes, has caused or may cause significant harm to the environment, human life or property* which is defined as an "incident" in section 30(1) of NEMA.

In terms of the National Water Act (Act 36 of 1998) an incident is defined as:
Any incident or accident in which a substance-

(a) pollutes or has the potential to pollute a water resource or
(b) has, or is likely to have, a detrimental effect on a water resource (NWA, 1998, section 20 (1))

The administration of section 30 of NEMA entails the management of information generated during an incident and extends to monitoring the clean-up and remediation undertaken by the responsible person and may involve enforcement action against the responsible person in the event of non-compliance.

Further clarity on some of the key concepts & terms contained in the definition of an "incident" are provided below:
"**unexpected"** – not expected or anticipated and/or surprising,
"**sudden"** – occurring or done unexpectedly or without warning, abrupt, hurried, hastily,
"**uncontrolled release"** – loss of containment, whether from the primary or any other containment (as the "containment" is what constitutes the "control"),
"forthwith" – immediately, without hesitation or delay"
"significant harm to the environment, human life or property" –

- **"significant"** – large enough to be noticeable or have noticeable effects,
- **"harm"** – damage or injury that is caused by a person or an event.

"hazardous substance" – a solid, liquid, vapour, gas or aerosol, or combination thereof, which is a source of danger to persons and to the environment, by reason of its toxic, corrosive, irritant,

strongly sensitizing or flammable nature, or because it generates pressure through decomposition, heat or other means". The DEA guideline on the administration of incidents (2019) contains lists of a substances and volumes that are indicators of a substance being hazardous which can be used to determine if an incident has occurred or not.

9.1 WHAT CONSTITUTES AN INCIDENT?

An incident is an occurrence where all the key concepts as indicated in the definition are present. There would have to be an unexpected loss of containment of a substance that is identified as such in the list of hazardous substances in the guideline – the substance would have been placed into this list by virtue of the fact that the substance is regarded as hazardous and as having the potential for causing serious danger to the public and/ or serious pollution of the environment. The duration of the possible impacts of an incident is irrelevant as the definition incorporates both immediate and delayed impacts.

Some of the more typical hazardous substances and volumes are listed below in Table 17, but the full list must be kept on site for quick and ease of reference.

Table 17: Typical hazardous substances and volumes listed in the guideline (Annexure 3) as constituting an "incident" when a lack of containment occurs.

NO.	NAME	CAS CODE	RQ
358	Air, compressed	None	10
364	Alcoholic Beverages, with more than 70% alcohol by volume		10
590	Batteries, containing sodium	UN 3292	10
591	Batteries, dry, containing potassium hydroxide solid	UN3028	10
592	Batteries, wet, filled with acid, or alkali	UN 2795	10
593	Battery fluid, acid	UN 2796	10
594	Battery fluid, alkali	UN 2797	10
611	Benzene	71-43-2	5
780	Caffeine	58-08-2	10
982	Creosote	8001-58-9	0.5
983	Creosote	8021-39-4	0.5
1130	Diesel fuel	68334-30-5	100
1131	Diesoline	68334-30-5	100
1415	Gasoline	86290-81-5	100
1561	Kerosene	64742-82-1	100
1562	Kerosene	8008-20-6	100
1680	Methane	74-82-8	5000
1885	Nitroglycerin	UN3064	10
1985	Organophosphorous pesticides and herbicides with an LD50 value above 50 mg/kg	130538-97-5	10

2011	Oxygen, compressed	UN1072	10
2018	Paraffin	64742-82-1	100
2019	Paraffin	8008-20-6	100
2066	Petrol	86290-81-5	100
2068	Petroleum Thinners (Turpentine)	8006-64-2	100
2167	Printing ink, flammable or printing ink related material (including printing ink thinning or reducing compound) flammable	UN1210	10
2176	Propane	74-98-6	5000
2363	Sulphuric acid	7664-93-9	500

Legend:
RQ – Reportable Quantity
CAS - Chemical Abstracts Service

The actual and potential pollution that the incident may cause includes, as per the definition of 'pollution' in NEMA, any change to the environment caused by substances, radioactive or other waves, noise, odours, dust and heat.

The receiving environment that may be impacted upon includes, as per the definition of 'environment' in NEMA, the aquatic, terrestrial, built and atmospheric components of the environment.

Table 18: Incident identification checklist (adapted from DEA&DP, 2010).

No.	CRITERIA	YES/NO	COMMENT
1.	Was the incident unexpected, sudden and uncontrolled?		
2.	Did the incident involve a release of a hazardous substance from a major emission, fire or explosion?		
3.	Did the incident have a potential to release of a hazardous substance from a major emission, fire or explosion?		
4.	Was the incident reported in the media?		
5.	Have there been any public complaints relating to the incident?		
6.	Did anyone have to receive medical attention as a result of the incident?		
7.	Is it practically possible that someone may have been in serious danger as a result of the incident?		
8.	Is it possible that someone may, in the future, be exposed to serious danger as a result of the incident?		

9.	Is it possible that, under different, but feasible, circumstances (e.g. weather conditions, proximity to schools, etc.) someone could have been exposed to serious danger as a result of the incident?		
10.	Did the incident result in a change to the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people?		
11.	Is it possible that the incident could have resulted in a change to the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people?		
12.	Is it possible that the incident may be the cause of any future change to the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people?		
13.	Is it possible that, under different, but feasible, circumstances (e.g. weather conditions, proximity to rivers, wetlands, etc.) the incident may have caused a change to the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people?		
14.	Has the incident had an impact on water?		

Interpretation of checklist:

i. If the answer to questions 1 and 2 is "yes", then the incident must be regarded as an emergency occurrence and, as such, all the provisions of Major Hazards Installation (MHI) Regulations (GN No. R. 692, 30 July 2001) Section 7, in terms of the Occupational Health & Safety (OHS) Act (Act 85 of 1993) as amended apply.
ii. If the answer to questions 1, 2 and any of the remaining questions is "yes", then the incident must be regarded as an emergency & incident and, as such, all the provisions of Section 30 of NEMA and MHI Regulations Section 7 apply.
iii. If the answer to questions 1, 2, 3 and any of the remaining questions is "yes", then the incident must be regarded as an emergency & incident and, as such, all the provisions of Section 30 of NEMA, MHI Regulations Section 7 and Water Act Section 20 apply.
iv. In accordance with the precautionary principle, all fires, explosions or emissions involving an unknown or unlisted substance and/or quantity of substance, must be reported. Where limited information is available regarding the composition of the mixture or the waste, it should be

assumed to consist entirely of the most toxic known component and reporting should be done accordingly. As a final measure, reporting should take place where any of the hazard codes or hazard phrases (in Table 19) according to the Global Harmonised System (GHS) and/or SANS 10234 appear on the Safety Data Sheet (SDS) for that substance.

Table 19: List of hazard codes and RQ values (adapted from DEA&DP, 2010).

HAZARD CODE	HAZARD STATEMENT	PROPOSED RQ (KG)
H200	Unstable explosive	0.5
H201	Explosive; mass explosion hazard	0.5
H220	Extremely flammable gas	50
H222	Extremely flammable aerosol	50
H224	Extremely flammable liquid and vapour	50
H225	Highly flammable liquid and vapour	500
H226	Flammable liquid and vapour	2500
H250	Catches fire spontaneously if exposed to air	0.5
H251	Self-heating; may catch fire	0.5
H260	In contact with water releases flammable gases that may ignite spontaneously	0.5
H270	May cause or intensify fire; oxidizer	0.5
H271	May cause fire or explosion; strong oxidizer	0.5
H300	Fatal if swallowed	0.5
H301	Toxic if swallowed	5

9.2 PROCEDURES & ACTIONS FOLLOWING AN INCIDENT

Section 30 of NEMA consists of 10 subsections and at least eleven (11) possible actions can be identified within these ten subsections (Table 20). For every incident, the 11 actions can be regarded as falling into one of two stages; namely a containment stage and a review stage (Figure 9).

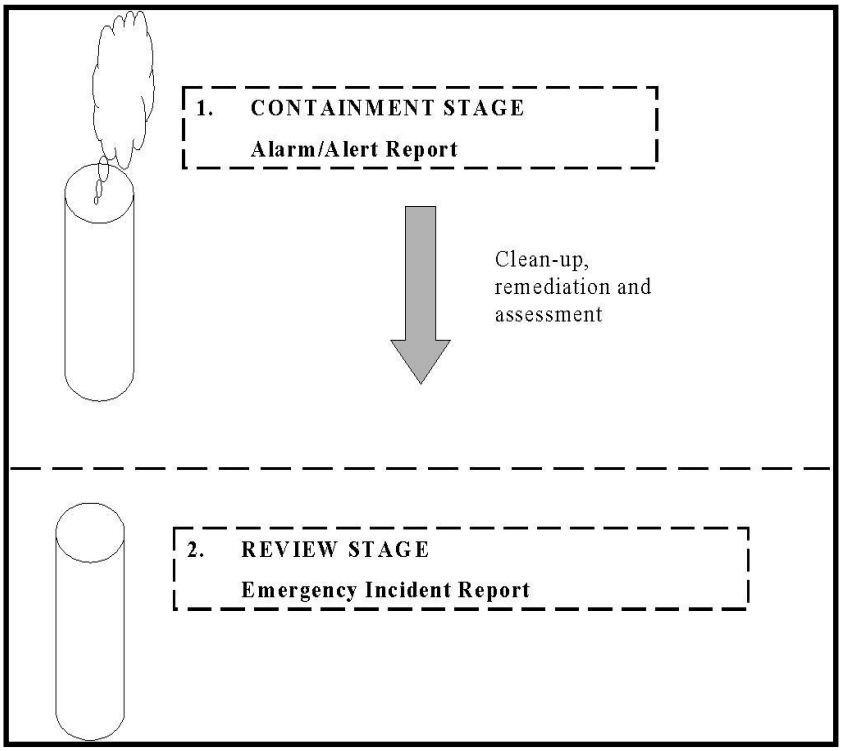

Figure 9. The two stages of an environmental incident (DEA & DP, 2010).

The containment stage is the response stage in which the focus is upon the containment, clean up, remediation and preliminary assessment of the incident. Sections 30(2) to 30(4) are relevant to this stage of the incident.

Section 30(5) is specific to the review stage of the incident. The focus of this stage is the post-clean up assessment of the incident and reporting of the relevant information to the authorities. This information is critical for future prevention and management of incidents.

Subsections (6) and (7) provide relevant authorities with the legislative mandate to enforce the need for responsible persons to report, clean up, remediate and assess the long-term impacts of the incident. Relevant authorities could invoke these subsections in either the containment stage or the review stage.

Lastly, subsections (8) to (10) make provision for the authority to intervene and undertake the clean-up, remediation and assessment activities on behalf of the responsible person and to claim reimbursement for expenses incurred in this process from the responsible person. This action is likely to begin in the containment stage and to be concluded in the review stage.

Table 20: List of actions and role players in section 30 of NEMA.

ACTION NO.	ACTION	RESPONSIBILITY	REFERENCE
1	Initial reporting of the incident to the authorities	Responsible person	Section 30(3)
2	Containing and minimising the effect of the incident to the environment, health, safety and property of persons	Responsible person	Section 30(4a)
3	Undertaking clean up procedures	Responsible person	Section 30(4b)
4	Remedying the effects of the incident	Responsible person	Section 30(4c)
5	Assessing the immediate and long-term effects of the incident on the environment and public health	Responsible person	Section 30(4d)
6	Initial evaluation reporting within 14 days of the incident	Responsible person	Section 30(5)
7	The issuing of a directive by a relevant authority for actions 2-6 above	Relevant authority	Section 30(6)
8	Confirmation of a verbal directive in writing	Relevant authority	Section 30(7)
9	Undertaking of actions 2-4 by the relevant authority where the responsible person fails to act	Relevant authority	Section 30(8)
10	Claiming reimbursement of all reasonable costs from every responsible person	Relevant authority	Section 30(9)
11	Comprehensive reporting by a relevant authority which has exercised actions 7-9 above	Relevant authority	Section 30(10)

9.2.1 Typical equipment that must be available to assist in the containment of an incident

The following equipment is required to successfully implement this procedure. It must be ensured that the equipment is supplied to or is readily available for all living quarters, site offices, kitchen areas, workshop areas, stores and on site.

1. A spill kit including hydrocarbon absorbent fibres, mats and booms (preferably hydrophobic)
2. A net
3. A whistle
4. Adequate lighting for night shifts
5. Spades
6. Sand bags
7. Designated hazardous waste drums
8. (Trained personnel with) protective clothing for extinguishing fires

9. Fire extinguishers
10. Fire beaters
11. Water carts/tankers with pumps and hoses
12. Water pumps and pipes (for fires started at the watercourse crossings)

9.3 REPORTING PROCESS

The reporting process will only commence if the occurrence qualifies as an "incident", as previously described. The process flow for the response to an incident in terms of section 30 of NEMA is illustrated in Figure 10.

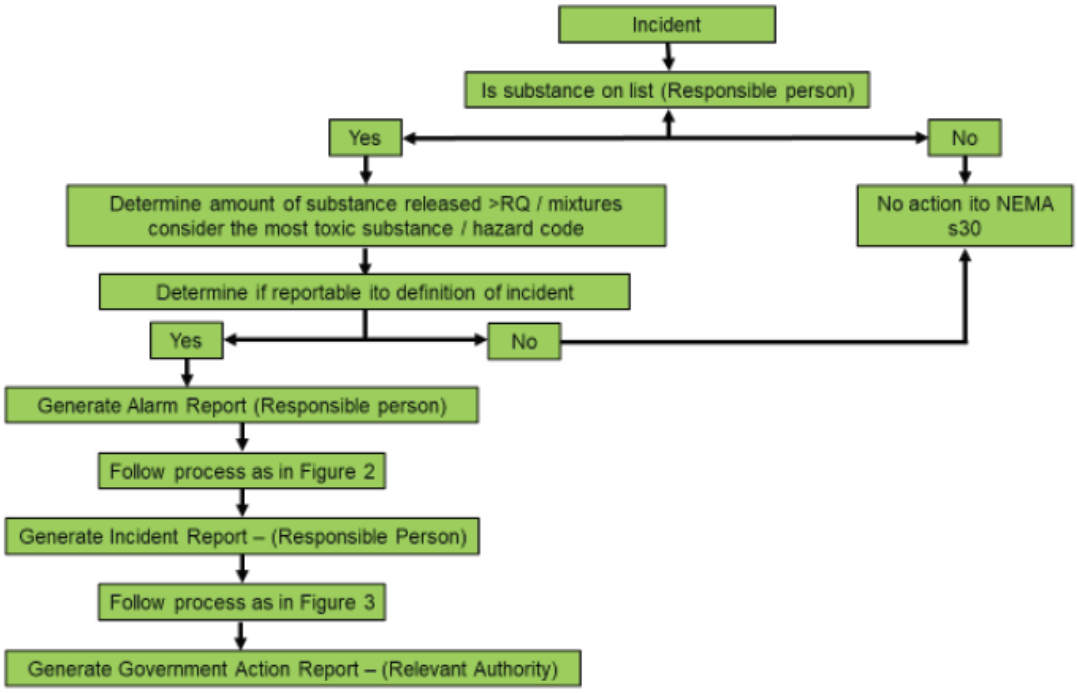

Figure 10. Process flow of an incident in terms of section 30 of NEMA.

9.3.1 TYPES OF REPORTS

Two types of reports are required following an incident as described below.

9.3.1.1 Alarm Report (section 30(3))

The Alarm Report represents the first reporting step in the incident process and must be compiled immediately and without delay. The purpose of this report is for the responsible person to notify relevant authorities that an incident has occurred and to provide basic information on the nature of the incident so that decisions can be made as to the most effective way of dealing with the incident.

The Alarm Report must be compiled by the either the responsible person or the employer of the responsible person. The Alarm Report must be submitted by the responsible person to the following relevant authorities:

- The Director-General (Department of Forestry, Fisheries and the Environment (DFFE))

- The South African Police Service (SAPS) and the relevant emergency services
- The relevant provincial head of department or municipality
- All persons whose health may be affected by the incident.

Section 30(3) of NEMA requires the responsible person to report the following minimum information in the Alarm Report:

- The nature of the incident
- Any risks posed by the incident to public health, safety and property
- The toxicity of substances or by-products released by the incident and
- Any steps that should be taken in order to avoid or minimise the effects of the incident on public health and the environment.

In order to be able to take such steps, the following information should ideally be disclosed:

- Responsible person name, location, organisation, and telephone number
- Name and address of the party responsible for the incident
- Date and time of the incident
- Location of the incident
- Medium (e.g. land, water) affected by release or spill
- Number and types of injuries or fatalities (if any)
- Weather conditions at the incident location
- Name of the carrier or vessel, the railcar/truck number, or other identifying information
- Whether an evacuation has occurred
- Other departments notified or about to be notified and
- Any other information that may help emergency personnel respond to the incident

A crucial aspect of the administration of a section 30 incident is the sharing of information relating to the specific incident. It is therefore important that the authorities be kept informed of the incident.

9.3.1.2 Incident Report (section 30(5))

The Incident Report is compiled after the containment, clean up, remediation and preliminary assessment of the long-term residual impact of the incident have been completed. The report must be submitted to all relevant authorities within 14 days of the incident occurring. The purpose of this report is to inform the relevant authorities of the containment and remediation process that was followed and the results of the preliminary assessment of the long-term impacts of the incident. This report also provides information on the cause of the incident and the responsible person's proposed measures to prevent the recurrence thereof.

The Incident Report must be compiled by the responsible person and submitted to the following:

- The Director-General (DFFE)
- The relevant provincial head of department
- The relevant municipality

Section 30(3) of NEMA requires the responsible person to report the following information in the Incident Report:

- The nature of the incident
- The substances involved and an estimation of the quantity released and their possible acute effect on persons and the environment and data needed to assess these effects
- Initial measures taken to minimise impacts
- The causes of the incident, whether direct or indirect, including equipment, technology, system, or management failure
- The measures taken and to be taken to avoid a recurrence of such incident

It is recommended that as much of the following information as possible is also provided in the Incident Report:

- Responsible person name, location, organisation, and telephone number
- Name and address of the party responsible for the incident
- Date and time of the incident
- Location of the incident
- Medium (e.g. land, water) affected by release or spill
- Number and types of injuries or fatalities (if any)
- Weather conditions at the time of the incident
- Name of the carrier or vessel, the railcar/truck number, or other identifying information
- Whether an evacuation occurred
- Other departments which have received an Incident Report or who will receive an Incident Report
- Any other information that may help authorities undertake an initial evaluation of the incident

9.3.1.3 Government Action Report (section 30(10))

A Government Action Report (GAR) which is compiled by the relevant authority should demonstrate the necessity for the intervention by the relevant authority and should in terms of section 30(10) be compiled as soon as practically possible and submitted to all parties.

In addition to the information provided in the Incident Report, the relevant authority should ideally include as much of the following information as possible in the GAR:

- The factors which influenced the decision by the relevant authority to intervene
- The financial and other costs associated with the intervention
- The proposed plans to recover the costs from the responsible person (if applicable)

9.3.2 ROLE OF EACH ORGAN OF STATE

The role of the various spheres of Government is described in section 30(1)(c) in the definition of "relevant authority" as follows:

(i) A municipality with jurisdiction over the area in which an incident occurs;

(ii) A provincial head of department or any other provincial official designated for that purpose by the MEC in a province in which an incident occurs;

(iii) The Director-General (of Environment Affairs); and
(iv) Any other Director-General of a national department.

Section 30(2) provides a measure of co-ordination between the various relevant authorities in that it establishes a hierarchy of response. In this hierarchy, individual relevant authorities only exercise their authority in terms of section 30 if the authority preceding them has not exercised its authority. The responsibility of relevant authorities to take steps is set out in the manner it has been in the NEMA. By implication, it places a responsibility on all relevant authorities who become aware of an incident to confirm that the other authorities are aware thereof, as well as who must be involved in a particular incident (Figure 11). Cooperation amongst relevant authorities must be promoted throughout in the management of an incident.

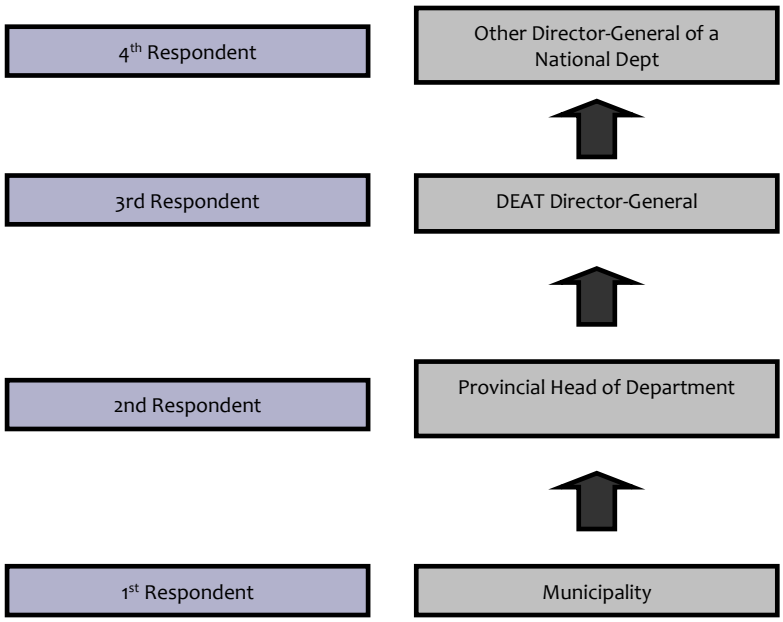

Figure 11. Hierarchy of Response by Relevant Authorities as per Section 30(2) of NEMA ((DEA & DP, 2010).

Similarly, the sharing of information regarding an incident must be promoted for every incident between those relevant authorities involved. Most notable, is the sharing of the AR, IR, GAR, initial evaluation of incidents and closure reports. Table 21 provides a list of known contacts that may be relevant to an incident and required for effective communication and reporting purposes.

The process following the receipt of the Alarm & Incident Report by the relevant authority is illustrated in Figure 12 & 13, respectively.

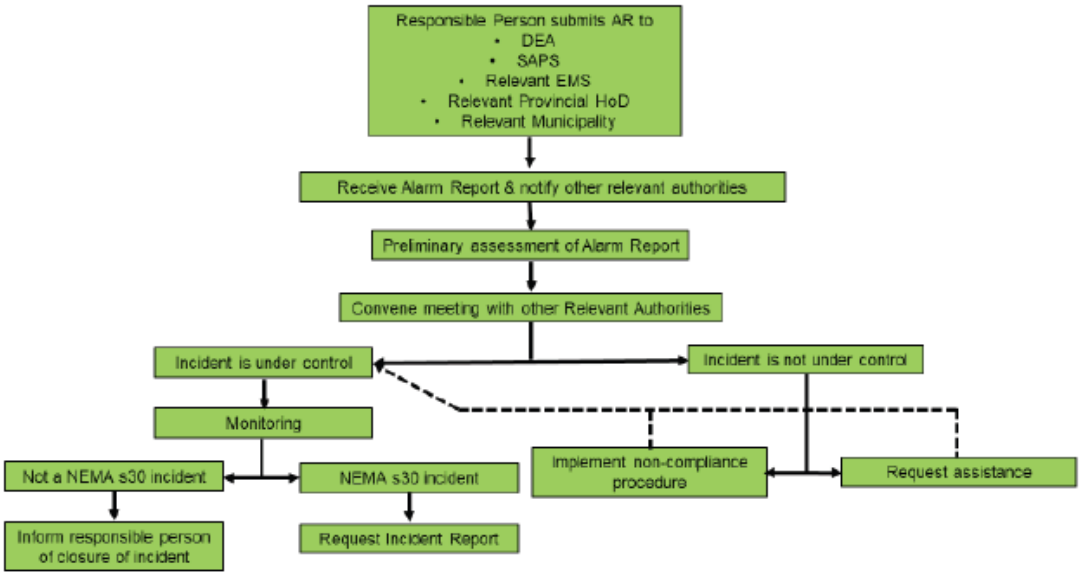

Figure 12. Flow diagram of the process following receipt of the Alarm Report by the relevant authority.

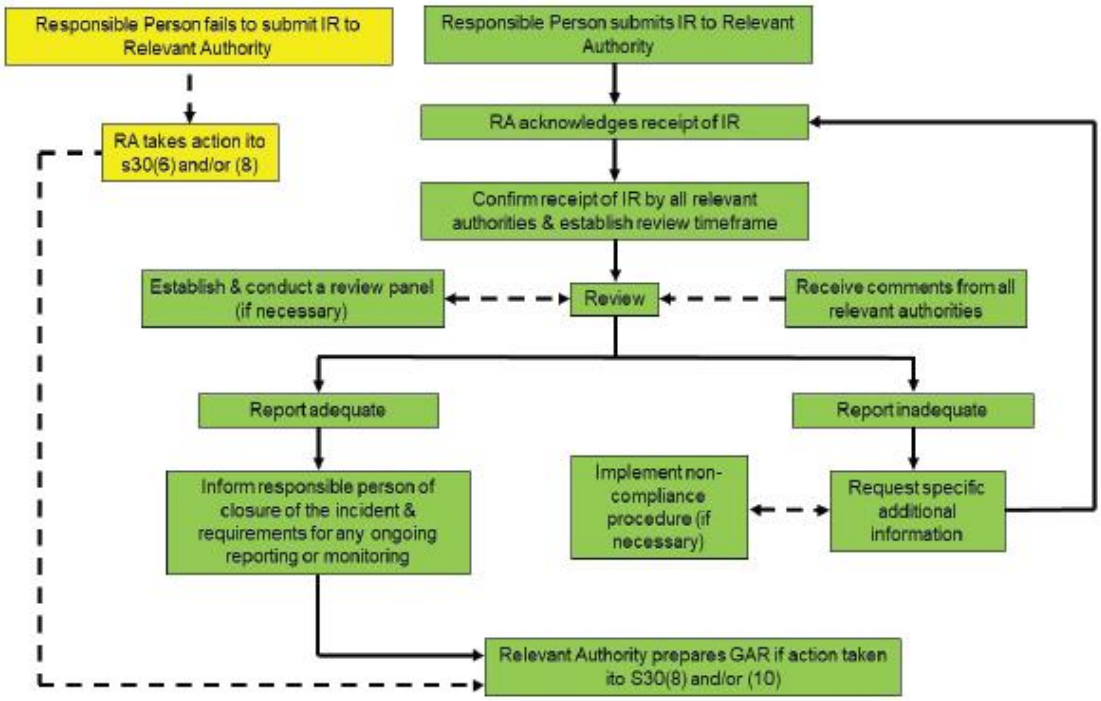

Figure 13. Flow diagram of the process following the receipt of the Incident Report.

Table 21: Contact details for persons relevant to an incident.

Organisation	Name	Contact details
Project Personnel		
Applicant: Soventix South Africa	Jean-Paul de Villiers	Tel: (021) 852 7333 Cell: 082 550 6672
Engineer		
Contractor		

HSO		
SEO		
ECO		
ESKOM	24hr Customer Contact Centre	086 003 7566
Interested and Affected Parties		
Landowner	Willem & Esmari Retief	Cell: 082 944 7167
Adjacent Landowner: Remainder of farm No. 149 Goedehoop	Ricky Vimpany	Cell: 082 868 1991
Adjacent Landowner: Remainder of Leuwefontein No. 27	Corneulis Oosthuizen	Cell: 061 271 0268
Adjacent Landowner: Portion 1, 2 & 4 Leuwefontein No. 27	Pieter du Toit	Cell: 083 278 2590
Adjacent Landowner: Remainder of Taaiboschfontein No. 41 and Portion 1	Andries Pienaar	Cell: 082 762 2206
Adjacent Landowner: Portion 2 & 5 Taaiboschfontein No. 41	Manual Orfao	Cell: 082 782 1972
Adjacent Landowner: Portion 3 of Taaiboschfontein No. 41	Dawie du Plessis	Cell: 083 544 4139
Adjacent Landowner: Remainder & Portion 7 &9 of Kafferspoort No. 56	Andries Pienaar	Cell: 082 762 2206
Adjacent Landowner: Remainder of Barendskuilen No. 38 and Remainder & Portion 1 of Blaauwboschkuilen Outspan No. 37	Christiaan Venter	Cell: 082 378 3601
Emergency Services		
Spill Clean-up Service Provider	Spill Tech (Mr Wouter Beukes)	Cell: 071 789 5695
Fire Department	Fire Brigade	Cell: 082 904 8614 / 082 904 8543 / 082 904 8517
Chief Fire Officer (Fire Chief)	Emthanjeni Fire Department	Tel: 053 632-9100
SA Police Services	De Aar SAPS	Tel: 053 632 9500
Disaster Management Centre	Mr T. Gaolaolwe	Tel: 053 807 9862 Cell: 076 173 8890 Email: Tgaolaolwe@ncpg.gov.za
Local Municipality	Mr Isak Visser (Municipal Manager)	Email: visser@emthanjeni.co.za Tel: 053 632 9101

District Municipality	Mr Rodney Pieterse (Municipal Manager)	Email: mm@pksdm.gov.za Tel: 053 631 0891
Irrigation Board	Upington Irrigation Board	Tel: 054 334 0488
Water Catchment Management Agency	Orange Water Management Agency (Mrs A Steenkamp)	Tel: 054 338 5840 Email: steenkampa@dws.gov.za
Water Treatment Works	Ms Lucy Billy	Cell: 078 389 4989
DWS (Regional Head of Department / Chief Director)	Mr Abe Abrahams	Email: AbrahamsA@dws.gov.za
DWS (Regional Director: Water sector Regulation & Use)	Mr Hlengani Alexia	Email: HlenganiA@dws.gov.za
DFFE (Provincial Head of Department)	Mr Denver van Heeden	Tel: 053 807 7306 Email: dvaheeden@ncpg.gov.za
DFFE (Director: Environmental Compliance and Enforcement)	Mr Sonnyboy Bapela	Tel: 012 399 9422 Email: sbapela@environment.gov.za
	Ms Frances Craigie	Tel: 012 399 9460 Email: fcraigie@environment.gov.za
DFFE (Director General)	Ms Vanessa Bendeman	Tel: 012 399 9337 Email: vbendeman@environment.gov.za
DFFE (Director: Environmental Impact Evaluation)	Mr Sabelo Malaza	Tel:012 3998792 Email: smalaza@environment.gov.za

The following tables provide guidance on what actions to implement in the event of context specific incidents.

Table 22: Spillage in a watercourse.

ACTION TO BE TAKEN		
Personnel	**Responsibility**	**Action**
Employee	Reporting	The person responsible for, or who discovers, a hazardous substance spill must report the incident to their immediate Supervisor.
Supervisor	Reporting	Report the incident to the SEO, HSO and Resident Engineer.

		● Note that the SEO will take control of all relevant actions once he/she arrives on the scene.
HSO	Reporting	Report the incident to an Inspector (designated under section 28 of the Occupational Health & Safety Act, 1993) within the prescribed period and manner.
Supervisor / SEO	Initial investigation	Determine the extent of the spill, i.e. its boundaries, by observing for the following: 1. Any visual indication of pollution, 2. Any odours or emissions detected, 3. Any indication of the source of pollution, 4. Any sign of damage to the natural system. ● The Supervisor / SEO should provide lighting if working at night.
Supervisor / SEO	Co-ordination	Sound an alarm/whistle. ● The designated response team consisting of area specific personnel and including the environmental leader, will congregate at the spill kit. ● All other employees who do not have specific duties to perform are to evacuate the affected area to a location designated by the Supervisor / SEO.
Supervisor / SEO	Co-ordination	Minimise the effects of the incident on the environment and persons by removing the source of the spill at least 100m away from the watercourse or cut-off the supply of the spill if the source is not moveable.
Supervisor / SEO	Co-ordination	Contain the spill by laying an absorbent sock or boom across the width of the watercourse AT A PRE-DETERMINED LOCATION downstream of the construction area (spill). ● A series of parallel booms may be required.
Supervisor / ECO	Co-ordination	Secure the affected area with danger tape.
HSO	Co-ordination	The site shall not be disturbed and no article or substance may be removed (without the consent of the inspector) if there is or likely to be a death, or if there is a loss of limb or part of a limb. However, action can be taken to prevent a further accident, to remove the injured or dead or rescue persons from danger.

Engineer / SEO / HSO	Decision-making	The Engineer will assess the situation in consultation with the SEO and HSO and act as required. ● The risk involved shall be assessed before anyone approaches the scene of the incident. ● The HSO will consult the MSDSs. ● The scale of the spill will dictate whether the spill will be cleaned up by using the on-site spill kit and in the prescribed manner, or by contacting a Spill Clean-Up Service Provider for assistance. ● The SEO will take photographs of the affected area. ● No person shall be allowed to approach a spill unless he/she is equipped with the personal protective clothing.
SEO	Directions	If a Spill Clean-Up Service Provider is used, assist the emergency services by clearly marking the route to be taken to the spill site.
SEO	Co-ordination	Take such measures as the Catchment Management Agency may either verbally or in writing direct within the time specified by such institution.

REMOVAL AND REMEDIATION MEASURES TO BE IMPLEMENTED

Personnel	Responsibility	Action
SEO	Co-ordination	Remove the contaminated sock or boom from the surface of the water. If lose fibres were scattered on the surface to capture hydrocarbons in shallow (still) pools, 'fish' it out with a net.
SEO	Co-ordination	Remove the contaminated soil from the banks of the watercourse, to the depth of penetration using a spade or shovel.
SEO	Co-ordination	Temporarily store the contaminant in the designated hazardous waste facility at the construction camp.
SEO	Co-ordination	Contact a licensed hazardous waste service provider to collect and transport the waste to a licensed hazardous waste landfill site.
SEO	Co-ordination	Rehabilitate the banks of the watercourse by replacing the topsoil and planting indigenous plants.
SEO	Monitoring	Immediately follow any known spillage of toxic substances into a stream or river with monitoring of the receiving streams or rivers and public health.

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Reg: 2006/023163/23

SEO	Co-ordination	Should water downstream of the spill be polluted, and fauna and flora show signs of deterioration or death, specialist hydrological or ecological advice must be sought for appropriate treatment and remedial procedures to be followed.
SEO	Monitoring	Take photographs of the affected area during rehabilitation.
INTERNAL & EXTERNAL COMMUNICATION PLAN		
Personnel	**Responsibility**	**Action**
Employee	Reporting	The person responsible for, or who discovers, a hazardous waste spill must report the incident to their immediate Supervisor.
Supervisor	Reporting	Report the incident to the SEO, HSO and Resident Engineer.
HSO	Reporting	Report the incident to an Inspector (designated under section 28 of the Occupational Health & Safety Act, 1993) within the prescribed period and manner.
SEO	Reporting	Report the incident to the Site Agent and / or Manager and the ECO.
SEO	Reporting	If the spill is too big for the spill kit, contact a Spill Clean-Up Service Provider.
SEO	Reporting	If the spill is going to affect downstream users, inform the Land Owner, the Irrigation Board and water treatment works (if applicable). ● Provide the following information to the water treatment works: 1. The exact location of the spillage, 2. The time of the spillage, 3. As much information about the nature of the pollution, 4. The name and telephone number of the person contacting them. ● Irrigation Boards control river structures and may be able to divert/or impound the river to protect 'water supply intakes'.

SEO	Reporting	Report the incident to the following authorities within 24 hours. 1. DFFE (Director General), 2. DWS (Director General and Chief Director), 3. SA Police Services, 4. Fire Department, 5. Catchment Management Agency, 6. DFFE (provincial Head of Department) or Local Municipality, and 7. Any persons whose health may be affected by the incident.
SEO	Reporting	Provide the following information: 1. The nature of the incident, 2. Any risks posed by the incident to public health, safety & property, 3. the toxicity of substances or by-products released by the incident, and 4. any steps that should be taken in order to avoid or minimise the effects of the incident on public health and the environment.
ECO / Applicant / Site Agent / CRE	Reporting	If the nature of the impact constitutes a gross violation of the EA or any legislation: ● The ECO must report the incident to the applicant. ● The applicant must report the incident to the Local Municipality, DFFE, and DWS. ● The Site Agent and / or Manager must report the incident to their Environmental Group Manager, Divisional MD and CEO. ● The Resident Engineer must report the incident to his Superiors.

PRESCRIBED REPORTING PROCEDURE		
Incident recording		
Personnel	**Responsibility**	**Action**
SEO	Investigation	Conduct an investigation, including interviews, and record all details of the incident. ● The cause must be investigated.
SEO	Reporting	Complete an Environmental Incident Report and forward it to all key project personnel, with the exception of the Emergency Services.

SEO	Reporting	Within 14 days of the incident, report the incident to the following authorities. 1. DFFE (Director General), 2. DFFE (Provincial Head of Department), 3. Local Municipality, 4. DWS (Regional Director).
SEO	Reporting	Provide the following information: 1. The nature of the incident, 2. The substances involved and an estimation of the quantity released and their possible acute effect on persons & the environment & data needed to assess these effects, 3. Initial measures to minimise impacts, 4. Causes of the incident, whether direct or indirect including equipment, technology, system or management failure, and 5. Measures taken & to be taken to avoid a recurrence of such incident.
SEO	Reporting	Submit an action plan within 14 days, or a shorter period of time, if specified by the Regional Director (DWS).
SEO	Reporting	The action plan must include the following information: 1. A detailed time schedule of measures taken to: 1.1 Correct the impacts resulting from the incident; 1.2 Prevent the incident from causing any further impact; and 1.3 Prevent a recurrence of a similar incident.
Progress reporting		
SEO	Revising Procedures	Identify methods for preventing the incident from re-occurring and revise method statements and/or procedures for implementing as early as possible.
SEO	Training	Conduct either a toolbox talk or environmental awareness training/re-induction to the all employees and include additional mitigations to avoid a re-occurrence. ● Keep the program, including a signed attendance register, in the on-site environmental file.

Table 23: Spillage on land.

ACTION TO BE TAKEN		
Personnel	**Responsibility**	**Action**
Employee	Reporting	The person responsible for, or who discovers, a hazardous substance spill must report the incident to their immediate Supervisor.
Supervisor	Reporting	Report the incident to the SEO, HSO and Resident Engineer. ● Note that the SEO will take control of all relevant actions once he/she arrives on the scene.
HSO	Reporting	Report the incident to an Inspector (designated under section 28 of the Occupational Health & Safety Act, 1993) within the prescribed period and manner.
Supervisor / SEO	Initial investigation	Determine the extent of the spill, i.e. its boundaries, by observing for the following: ● Any visual indication of pollution, ● Any odours or emissions detected, ● Any indication of the source of pollution, ● Any sign of damage to the natural system. The Supervisor / SEO should provide lighting if working at night.
Supervisor / SEO	Co-ordination	Sound an alarm/whistle. ● The designated response team consisting of area specific personal and including the environmental leader, will congregate at the spill kit. ● All other employees who do not have specific duties to perform are to evacuate the affected area to a location designated by the Supervisor / SEO.
Supervisor / SEO	Co-ordination	Minimise the effects of the incident on the environment and persons by removing the source of the spill at least 100m away from the watercourse or cut-off the supply of the spill if the source is not moveable.
Supervisor / ECO	Co-ordination	Contain the spill to a confined area to prevent the spreading of the spilled chemical or substance. ● Use sand bags or construct earth berms. ● If relevant, close off all storm water drains with absorbent mats. ● Do not wash the spill with water as it will cause the spill to spread.

Supervisor / ECO	Co-ordination	Secure the affected area with danger tape.
HSO	Co-ordination	The site shall not be disturbed and no article or substance may be removed (without the consent of the inspector) if there is or likely to be a death, or if there is a loss of limb or part of a limb. However, action can be taken to prevent a further accident, to remove the injured or dead or rescue persons from danger.
Engineer / SEO / HSO	Decision-making	The Engineer will assess the situation in consultation with the SEO and HSO and act as required. ● The risk involved shall be assessed before anyone approaches the scene of the incident. ● The HSO will consult the MSDSs. ● The scale of the spill will dictate whether the spill will be cleaned up by using the on-site spill kit and in the prescribed manner, or by contacting a Spill Clean-Up Service Provider for assistance. ● The SEO will take photographs of the affected area. ● No person shall be allowed to approach a spill unless he/she is equipped with the personal protective clothing.
SEO	Directions	If a Spill Clean-Up Service Provider is used, assist the emergency services by clearly marking the route to be taken to the spill site.
REMOVAL AND REMEDIATION MEASURES TO BE IMPLEMENTED		
Personnel	**Responsibility**	**Action**
SEO	Co-ordination	Remove the contaminated soil to the depth of penetration using a spade or shovel.
SEO	Co-ordination	Temporarily store the contaminant in the designated hazardous waste facility at the construction camp.
SEO	Co-ordination	Contact a licensed hazardous waste service provider to collect and transport the waste to a licensed hazardous waste landfill site.
SEO	Co-ordination	Rehabilitate the area cleared of hazardous waste by replacing the topsoil and planting indigenous plants.
SEO	Monitoring	Immediately follow any known spillage of toxic substances with monitoring of the receiving environment, and public health if necessary.

SEO	Monitoring	Take photographs of the affected area during rehabilitation.
INTERNAL & EXTERNAL COMMUNICATION PLAN		
Personnel	**Responsibility**	**Action**
Employee	Reporting	The person responsible for, or who discovers, a hazardous waste spill must report the incident to their immediate Supervisor.
Supervisor	Reporting	Report the incident to the SEO, HSO and Resident Engineer.
HSO	Reporting	Report the incident to an Inspector (designated under section 28 of the Occupational Health & Safety Act, 1993) within the prescribed period and manner.
SEO	Reporting	Report the incident to the Site Agent and/or Manager and the ECO.
SEO	Reporting	If the spill is too big for the spill kit, contact a Spill Clean-Up Service Provider.
SEO	Reporting	Report the incident to the following authorities. 1. DFFE (Director General), 2. SA Police Services, 3. Fire Department, 4. DFFE (Provincial Head of Department) or Local Municipality, and 5. Any persons whose health may be affected by the incident.
SEO	Reporting	Provide the following information: 1. The nature of the incident, 2. Any risks posed by the incident to public health, safety & property, 3. the toxicity of substances or by-products released by the incident, and 4. Any steps that should be taken in order to avoid or minimise the effects of the incident on public health and the environment.
ECO / Applicant / Site Agent / RE	Reporting	If the nature of the impact constitutes a gross violation of the EA or any legislation: ● The ECO must report the incident to the applicant. ● The applicant must report the incident to the Local Municipality, DFFE, and DWS.

		● The Site Agent and/or Manager must report the incident to their Environmental Group Manager, Divisional MD and CEO. ● The Resident Engineer must report the incident to his Superiors.
PRESCRIBED REPORTING PROCEDURE		
Incident recording		
Personnel	**Responsibility**	**Action**
SEO	Investigation	Conduct an investigation, including interviews, and record all details of the incident. ● The cause must be investigated.
SEO	Reporting	Complete an Environmental Incident Report and forward it to all key project personnel, with the exception of the Emergency Services.
SEO	Reporting	Within 14 days of the incident, report the incident to the following authorities. 1. DFFE (Director General) 2. DFFE (Provincial Head of Department), and 3. Local Municipality.
SEO	Reporting	Provide the following information: 1. The nature of the incident, 2. The substances involved and an estimation of the quantity released and their possible acute effect on persons & the environment & data needed to assess these effects, 3. Initial measures to minimise impacts, 4. Causes of the incident, whether direct or indirect including equipment, technology, system or management failure, and 5. Measures taken & to be taken to avoid a recurrence of such incident.
Progress reporting		
SEO	Revising Procedures	Identify methods for preventing the incident from re-occurring and revise method statements and/or procedures for implementing as early as possible.
SEO	Training	Conduct either a toolbox talk or environmental awareness training/re-induction to the employee(s) responsible for the spill and include additional mitigations to avoid a re-occurrence.

		● Keep the program, including a signed attendance register, in the on-site environmental file.

Table 24:Fire event.

ACTION TO BE TAKEN		
Personnel	**Responsibility**	**Action**
Employee	Reporting	The person who starts or discovers a fire must report it to their immediate Supervisor.
Supervisor	Reporting	Report the incident to the SEO, HSO and Resident Engineer. ● Note that the SEO will take over co-ordination of all relevant actions once he/she arrives on the scene.
SEO	Reporting	If there is potential for a fire to spread and endanger life, property or the environment, alert the landowner and Fire Department.
Land Owner	Reporting	Alert the owners of adjacent land.
HSO	Reporting	Report the incident to an Inspector (designated under section 28 of the Occupational Health & Safety Act, 1993) within the prescribed period and manner.
Supervisor / SEO	Co-ordination	Sound an alarm/whistle. ● The designated response team consisting of area specific personnel and including the environmental leader, will congregate at the fire-fighting equipment. ● All other employees who do not have specific duties to perform are to evacuate the affected area to a location designated by the Supervisor / SEO.
SEO	Directions	Assist the Fire Department by clearly marking the route to be taken to the fire.
SEO	Co-ordination	Extinguish the fire or assist in doing so.
SEO	Co-ordination	Stop the spread of the fire.
SEO	Co-ordination	Provide assistance to a fire protection officer or forest officer in the event that they take control over the fighting of a fire.
HSO	Co-ordination	The site shall not be disturbed and no article or substance may be removed (without the consent of the inspector) if there is or likely to

		be a death, or if there is a loss of limb or part of a limb. However, action can be taken to prevent a further accident, to remove the injured or dead or rescue persons from danger.
REMEDIATION MEASURES TO BE IMPLEMENTED		
Personnel	**Responsibility**	**Action**
SEO	Assessment	Immediately follow any fire with an assessment of the effects on the environment, public health, safety and property.
SEO	Search	Search the scorched earth for reptiles and other creatures that can be rehabilitated and saved. ● Use only a licensed rehabilitation facility.
SEO	Monitoring	Monitor for signs of erosion after the first few rains and new flush. ● Manage erosion resulting from a loss in plant basal or aerial cover. ● Ensure that the control measures are not destructive.
SEO	Managing	No Vehicles or plant are permitted to drive through burnt areas.
INTERNAL & EXTERNAL COMMUNICATION PLAN		
Personnel	**Responsibility**	**Action**
Employee	Reporting	The person who starts or discovers a fire must report the incident to their immediate Supervisor.
Supervisor	Reporting	Report the incident to the SEO, HSO and Resident Engineer. ● Note that the SEO will take control over all relevant actions once he/she arrives on the scene.
SEO	Reporting	Report the incident to the Site Agent and/or Manager and the ECO.
SEO	Reporting	If there is potential for a fire to spread and endanger life, property or the environment, alert the landowner and Fire Department.
Land Owner	Reporting	Alert the owners of adjacent land.
HSO	Reporting	Report the incident to an Inspector (designated under section 28 of the Occupational Health & Safety Act, 1993) within the prescribed period and manner.

SEO	Reporting	Report the incident to the following authorities. 1. DFFE (Director General), 2. SA Police Services, 3. Fire Department, 4. DFFE (Provincial Head of Department) or Local Municipality, and 5. Any persons whose health may be affected by the incident.
SEO	Reporting	Provide the following information: 1. The nature of the incident, 2. Any risks posed by the incident to public health, safety & property, 3. the toxicity of substances or by-products released by the incident, and 4. any steps that should be taken in order to avoid or minimise the effects of the incident on public health and the environment.
ECO / Applicant / Site Agent / RE	Reporting	If the nature of the impact constitutes a gross violation of the EA or any legislation: ● The ECO must report the incident to the applicant. ● The applicant must report the incident to the Local Municipality, DFFE, and DWS. ● The Site Agent and / or Manager must report the incident to their Environmental Group Manager, Divisional MD and CEO. ● The Resident Engineer must report the incident to his Superiors.
PRESCRIBED REPORTING PROCEDURE		
Incident recording		
Personnel	**Responsibility**	**Action**
SEO	Investigation	Conduct an investigation, including interviews, and record all details of the incident. ● The cause must be investigated.
SEO	Reporting	Complete an Environmental Incident Report and forward it to all key project personnel, with the exception of the Emergency Services.
SEO	Reporting	Within 14 days of the incident, report the incident to the following authorities. 1. DFFE (Director General), 2. DFFE (Provincial Head of Department), and 3. Local Municipality.

SEO	Reporting	Provide the following information: 1. The nature of the incident, 2. The substances involved and an estimation of the quantity released and their possible acute effect on persons & the environment & data needed to assess these effects, 3. Initial measures to minimise impacts, 4. Causes of the incident, whether direct or indirect including equipment, technology, system or management failure, and 5. Measures taken & to be taken to avoid a recurrence of such incident.
Progress reporting		
SEO	Revising Procedures	Identify methods for preventing the incident from re-occurring and revise method statements and/or procedures for implementing as early as possible.
SEO	Training	Conduct either a toolbox talk or environmental awareness training/re-induction to the employee(s) responsible for the spill and include additional mitigations to avoid a re-occurrence. ● Keep the program, including a signed attendance register, in the on-site environmental file.

9.3.3 Incident Report Template

This form provides a template for the emergency incident report required in terms of section 30(5) of the National Environmental Management Act (Act No. 107 of 1998) (as amended) (hereinafter "NEMA") in which the responsible person or, where the incident occurred in the course of that person´s employment, his or her employer, must, within 14 days of the incident, report to the Director General, provincial head of department and municipality such information as is available to enable an initial evaluation of the incident, including: (a) the nature of the incident; (b) the substances involved and an estimation of the quantity released and their possible acute effect on persons and the environment and data needed to assess these effects; (c) initial measures taken to minimise impacts; (d) causes of the incident, whether direct or indirect, including equipment, technology, system, or management failure; and (e) measures taken and to be taken to avoid a recurrence of such incident.

In terms of section 30(1)(a) of NEMA, an "incident" means an unexpected, sudden and uncontrolled release of a hazardous substance, including from a major emission, fire or explosion, that causes, has caused or may cause significant harm to the environment, human life or property. In line with section 24 of the Constitution of the Republic of South Africa (Act No. 108 of 1996), "serious" is taken to be a measure of the impact of an incident where such an

incident has had, could have had, is having, or will have a negative impact on human health or well-being.

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soventix Powerful Returns	**Document type:**	**Incident Report**		
	Title for the incident:			
	Date of the incident:			
Reference:		**Initial submission date:**		
Revision No.:		**Compiled by:**		
1. RESPONSIBLE PERSON				
In terms of section 30(1)(b) of NEMA, the "responsible person" includes any person who: (i) is responsible for the incident; (ii) owns any hazardous substance involved in the incident; or (iii) was in control of any hazardous substance involved in the incident at the time of the incident				
1.1 Name:		**1.2 Designation:**		
1.3 Postal address:		**1.4 Physical address:**		
1.5 Telephone (B/H):		**1.6 Telephone (A/H):**		
1.7 Fax:		**1.8 Email:**		
1.9 Nature of business:				
2. EMERGENCY INCIDENT SUMMARY INFORMATION				
Mark the appropriate boxes				

2.1 Fire:		**2.2 Spill:**		**2.3 Explosion:**		**2.4 Gaseous explosion:**	
2.5 Injuries:		**2.6 Reportable injuries:**		**2.7 Hospitalisation:**		**2.8 Fatalities:**	
2.9 Open water impacts:		**2.10 Groundwater impacts:**		**2.11 Atmospheric impacts:**		**2.12 Soil impacts:**	
2.13 Own emergency response involved:		**2.14 Fire prevention services involved:**		**2.15 Government hazardous materials emergency response involved:**		**2.16 More than 1 governmental emergency response service involved:**	
2.17 Emission of non-toxic substances at low concentrations:		**2.18 Emission of non-toxic substances at high concentrations:**		**2.19 Emission of toxic substances at low concentrations:**		**2.20 Emission of toxic substances at high concentrations:**	
2.21 No evacuation required:		**2.22 Immediate area evacuated:**		**2.23 Immediate surrounds evacuated:**		**2.24 Evacuation of the general public:**	
25. Others:							

3. INITIAL INCIDENT REPORT				
In terms of section 30(3) of NEMA, the responsible person or, where the incident occurred in the course of that person´s employment, his or her employer must forthwith after knowledge of the incident, report through the most effective means reasonably available: (a) the nature of the incident; (b) any risks posed by the incident to public health, safety and property; (c) the toxicity of substances or by-products released by the incident; and (d) any steps that should be taken in order to avoid or minimise the effects of the incident on public health and the environment to: (i) the Director General; (ii) the South African Police Services and the relevant fire prevention service; (iii) the relevant provincial head of department or municipality; and (iv) all persons whose health may be affected by the incident.				
3.1 Description	3.2 Date:	3.3 Time:	3.4 Medium:	3.5. Name and contact details:

Relevant fire prevention service: (in case of fire)	[submission date]	[submission time]	[Fax, phone, SMS, letter, etc.)	[Who was the report made to?]	
LOCAL:					
PROVINCIAL: (Those that deal with Environmental issues)					
DIRECTOR GENERAL: (DFFE)					
Any other Director General of National Department, E.g. DWS					

4. INCIDENT DETAILS

In terms of NEMA section 30(5)(a) and (d), the responsible person must report on the nature of the incident as well as the causes of the incident, whether direct or indirect, including equipment, technology, system, or management failure

4.1 Location of the incident	[Provide physical address of the location where the incident happened including the GPS co-ordinates]		
4.2 Incident start date and time:		**4.3 Incident duration:**	
4.4 Duration of exposure:			
4.5. Incident description:			
Background of the incident:			

Operation:					
Incident type:					
Root cause of the incident:					
Contributory factors to the incident:					
Conclusion:					
4.6 Wind speed and direction		**4.7 Ambient air temperature**			
4.8 Weather conditions		**4.9 Other relevant meteorological conditions**			
5. POLLUTANTS RELEASED DURING INCIDENT					
In terms of NEMA section 30(5)(b), the responsible person must report on the substances involved and an estimation of the quantity.					
List all the pollutants directly released during the incident (i.e. exclude those pollutants that resulted from mitigation measures, e.g. flaring, treatment, dilution etc.)					
5.6 Substance or mixture of substances	**5.2 Reference Number**	**5.3 Phase eg solid, liquid or gas**	**5.4 Total Quantity emitted/ released**	**5.5 Units eg Kg, L etc**	**5.6 Nature of emission/ release**

[The namerecognisedby any nationalor internationallyrecognisedchemicalreferencingsystem]	[Referencetoany nationalor internationallyrecognisedchemicalreferencingsystem]	[solid,semi-solid,liquid orgas]	[the totalmeasuredor estimatedquantityreleasedinto the environment]	[the unit ofmeasure inrespect tothe quantity]	[Emittedfrom truck,undergroundpipe, stack,etc.]
6. SECONDARY POLLUTANTS RESULTING FROM INCIDENT					
In terms of NEMA section 30(5)(b), the responsible person must report on the substances involved and an estimation of the quantity released.					
List all the pollutants that resulted from mitigation measures, e.g. flaring, treatment, dilution etc.					
6.1 Substance or mixture of substances	**6.2 Reference Number**	**6.3 Phase**	**6.4 Total Quantity emitted/released**	**6.5 Unit**	**Nature of emission**

[The name recognised by any national or internationally recognised chemical referencing system]	Reference to any national or internationally recognised chemical referencing system]	[solid, semi-solid, liquid or gas]	[the total measured or estimated quantity released into the environment]	[the unit of measure in respect to the quantity]	[Emitted from truck, underground pipe, stack, etc.]

7. POLLUTANT CONCENTRATIONS					
In terms of NEMA section 30(5)(b), the responsible person must report on the substances involved and an estimation of the quantity released.					
List all the pollutants detailed in previous section:					
7.1 Substance or mixture of substances	**7.2 Reference Number**	**7.3 Estimated pollutant concentration on different radius**			
		7.3.110m	**7.3.2100m**	**7.3.3500m**	**7.3.4>2000m**

[The name recognised by any national or internationally recognised chemical referencing system]	[Reference to any national or internationally recognised chemical referencing system]	[estimate the concentration of the pollutant in water, soil and/ or air within a 10m radius of the epicentre of the incident] [provide the units used in a case of estimating concentration (e.g. ppm]	[estimate the concentration of the pollutant in water, soil and/ or air within a 100m radius of the epicentre of the incident] [provide the units used in a case of estimating concentration (e.g. ppm)]	[estimate the concentration of the pollutant in water, soil and/or air within a 500m radius of the epicentre of the incident] [provide the units used in a case of estimating concentration (e.g. ppm)]	[estimate the concentration of the pollutant in water, soil and/or air within a > 2000 m radius of the epicentre of the incident] [provide the units used in a case of estimating concentration (e.g. ppm)]

NOTE: Include 1. Concentration at the plume and 2. Concentration that was falling on the ground.

8. INCIDENT IMPACT

In terms of NEMA section 30(5)(b), the responsible person must report on possible acute effects on persons and the environment and the responsible must provide data needed to assess these effects;

8.1 Minor injuries	[Describe the number and types of any minor injuries that resulted from the incident or efforts to manage the incident or the impacts thereof]

8.2 Reportable injuries	[Describe the number and types of any injuries requiring statutory reporting that resulted from the incident or efforts to manage the incident or the impacts thereof]
8.3 Hospitalisation	[Describe the number and types of any injuries that required professional medical care that resulted from the incident or efforts to manage the incident or the impacts thereof]
8.4 Fatalities	[Describe the number and cause of any fatalities that resulted from the incident or efforts to manage the incident or the impacts thereof]
8.5 Biological impacts	[Describe any impacts on biological life, other than human life, e.g. fish kills, plant mortality, etc.]
8.6 Impact area	[Describe the area possibly affected by the incident or the impacts thereof including: (i) size of the area; (ii) socio-economic context; (iii) population density; (iv) sensitive environments (if any), etc.]
8.7 Data	Attach relevant impact reports, medical reports, death certificates, post mortem reports, environmental monitoring data, etc. as Annexes C1, C2,… to this report
9. EXISTING PREVENTION PROCEDURES AND/OR SYSTEMS	
9.1 Foresight	[Briefly describe whether the incident could have, or had, been foreseen, e.g. was it included in any environmental impact assessment, risk assessment, health and safety plan, etc.]
9.2 Procedures and/or systems	Attach any relevant safety, health and environmental plans (including any statutory planning requirements) that detail what actions should be taken in the event of the incident that is the subject of this report
9.3 Procedure and/or systems failures	[Describe any failures or shortfalls in procedures and/or systems that may have contributed to the incident] All procedures and checklist in place and signed off.
9.4 Technical measures	[Describe any technical measures, equipment, 'fail-safe' devices, etc. that are in place to prevent the occurrence of the incident] Communications & discussions in place.

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9.5 Technical failure	[Describe any failures of technical measures, equipment, 'fail-safe' devices, etc. that are in place to prevent the occurrence of the incident]		
10. INITIAL INCIDENT MANAGEMENT			
In terms of NEMA section 30(5)(c), the responsible person must report on initial measures taken to minimise impacts.			
10.1 Evacuation	[Describe any evacuation activities including information on the number of people evacuated and whether these people were staff or otherwise]		
10.2 Technical measures	[Describe all technical measures taken to address the incident]		
10.3 Mitigation measures	[Describe all measures taken to minimize the impact] SOPEP gear activated		
10.4 Emergency Services	[Describe any governmental emergency services involvement] SAMSA/TNPA advised		
11. CLEANUP AND/OR DECONTAMINATION			
In terms of NEMA section 30(5)(c), the responsible person must report on initial measures taken to minimise impacts.			
11.1 Cleanup and/or decontamination	[Report on initial cleanup and or decontamination (remediation) measures taken to minimise the impact of the incident on human health and the environment. Provide copy of safe disposal certificate (if any) and details of the company that undertook the cleanup]		
11.2 Permissions and Instructions			
Provide details of any permission and/or instructions received from any organ of state during initial incident management, cleanup and/or decontamination			
In terms of NEMA section 30(5)(c), the responsible person must report on initial measures taken to minimise impacts.			
11.3 Type	11.4 Statute	11.5 Issued By	11.6 Name and contact details

[Describe the nature or type of permission or instruction]	[Provide a reference to the legal mandate for the permission or instruction]	[Provide contact details for the permitting or instructing authority]	[provide a summary of the activities carried out in terms of the permission or instruction]
12. MITIGATION MEASURES			
In terms of NEMA section 30(5)(e), the responsible person must report on measures taken and to be taken to avoid a recurrence of such an incident.			
12.1 Measure	**12.2 Objective**	**12.3 Cost**	**12.4 Timing**
[Briefly describe each of the measures taken, and to be taken, to avoid a recurrence of such incident]	[Briefly describe the objective of the measure, i.e. the desired outcome of the measure]	[Estimate the cost of the measure in terms of capital costs and/or recurrent costs]	[Provide information on the timing for the full implementation of the measure]
13. AUTHORISATIONS			
Provide details on all authorisations (including permits, licenses, certificates, etc.) in respect of the activity to which this incident relates.			
13.1 Type	**13.2 Statute**	**13.3 Issued By**	**13.4 Issue & Expiry Date**
[Describe the nature or type of authorisation, e.g. Registration Certificate]	[Provide the reference for the authorisation, e.g. section X of the National Environmental Management Act (Act No. 107 of 1989)]	[Provide contact details for the issuing authority]	[provide the date of issue and expiry]
14. HISTORY			

Provide details of all similar incidents involving the responsible person in the past (i.e. from 1998). Similar incidents include those that: (i) involved similar circumstances; (ii) involved similar emissions; (iii) involved similar personnel; and/or (iv) involved similar impacts.			
14.1 Incident title	**14.2 Report reference**	**14.3 Date of incident**	**14.4 Summary of event**
[Provide the title used in the relevant emergency incident report]	[Provide the reference in respect of the relevant emergency incident report]	[Date of incident]	[Provide a summary of the event]
Signed by, or as a mandated signatory for, the responsible person:		Date:	

APPENDIX 1: List of affected people as results of the incident				
NAME	**ADDRESS**	**PHONE**	**FAULT**	**REMARKS**

APPENDIX 2 Layout map of the area likely to be affected or affected as a result of the incident

DISCLAIMER **Any other information not covered in the reporting template must be included.**
CAUTION
In terms of section 30 (11) of NEMA as amended, you are further advised that failure to comply with subsections (3), (4) and (5) above constitutes an offence and you may be liable on conviction to a fine not exceeding R5 million or to imprisonment for a period not exceeding 5 years, and in the case of a second or subsequent conviction to a fine not exceeding R10 million or to imprisonment for a period not exceeding 10 years, and in both instances to both such fine and such imprisonment.

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APPENDICES

The following appendices form part of this EMPr and must be implemented in accordance with their management measures and mitigations through the life-cycle of the project. They have been compiled as stand-alone documents in accordance with the requirements of the Department and will facilitate their use a Method Statement (MS) during construction and a Standard Operating Procedure (SOP) during operation. An Open Space Management Plan was not deemed necessary, as the development footprint will be securely fenced, and all areas outside the development footprint are deemed out-of-bounds. Furthermore, measures to monitor and detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage was not deemed relevant to this project due to the nature of the project and the associated lack of use and storage of such substances. Hazardous substances are dealt with under the management of waste in this EMPr.

Appendix 1 - Alien invasive management plan

Appendix 2 - Plant rescue and protection plan

Appendix 3 - Avifauna monitoring and management plan

Appendix 4 - Re-vegetation and habitat rehabilitation plan

Appendix 5 - Traffic management plan

Appendix 6 – Erosion management plan

Appendix 7 – Fire Management plan

Appendix 8 – Storm Water & Hydrology Management plan

Appendix 9 – Appendix 1 of Generic EMPr (sub-stations) including site specific conditions

Appendix 10 – Appendix 2 of Generic EMPr (distribution & transmission lines) including site specific conditions

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APPENDIX 1 - ALIEN INVASIVE MANAGEMENT PLAN

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APPENDIX 2 - PLANT RESCUE AND PROTECTION PLAN

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APPENDIX 3 - AVIFAUNA MONITORING AND MANAGEMENT PLAN

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APPENDIX 4 - RE-VEGETATION AND HABITAT REHABILITATION PLAN

REVEGETATION & HABITAT REHABILITATION PLAN (Cape Lowlands Environmental Services, 2012)

CONSTRUCTION PHASE

Various construction activities, such as establishing construction camp and waste collection area, construction of access roads, clear & grub activities and levelling could cause environmental damages leading to erosion. These environmental damages include disruption and disturbance of protected / endangered vegetation, damage to topsoil and compacting of ground.

In order to ensure reversal of the abovementioned impacts, the environment will be rehabilitated. Rehabilitation will occur subsequent to completion of construction & during decommissioning. Throughout the construction phase the management and mitigation measures prescribed in Table 24 must also be implemented. This will ensure not only that the environment is minimally damaged, but also that rehabilitation activities will be more effective.

- The Contractor shall take all appropriate and active measures to prevent erosion, especially wind and water erosion, during the rehabilitation of the construction phase. Any erosion caused on site during the construction phase as a result of runoff needs to be rehabilitated;
- Temporary erosion protection measures must be kept in place until permanent preventative measures (such as establishment of vegetation) is concluded;
- Areas where disturbance and loss of topsoil, scarring of the soil surface and land features have occurred (such as at the construction camp) must be filled with rehabilitated topsoil;
    - Topsoil removed during construction must be conserved and stockpiled (no more than 2 m in height) for rehabilitation use; and
    - All spills must be removed and disposed of at an approved dumping site and rehabilitated immediately.
- Compacted ground shall be rehabilitated by ripping to a minimum depth of 600mm;
    - Ripping will increase the soil's water storage capacity;
    - Stop soil erosion;
    - Alleviate the re-compaction; and
    - Allow deep root growth and water infiltration.
- Topsoil of at least 20 cm should be placed on top of the ripped soil. Following topsoil, the affected area should be re- vegetated;
- Areas prone to erosion caused by the removal of vegetation (such as around the bases of the panel foot pieces) must be rehabilitated with topsoil and the area re-vegetated:
    - Re- vegetation must include the use of only indigenous vegetation and plants similar to that of the natural surrounding areas;

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  - A Contractor appointed by the developer and Engineer shall be tasked to ensure that all weeds and alien & invasive species are removed as instructed and approved by the ECO;
  - No on-site burying, dumping or stockpiling of any weeds and aliens or invasive species may occur. Such should be removed from the site to a suitable dumping site from which seed cannot escape;
  - Site rehabilitation requires a well- designed planting program to be developed prior to re-vegetation; and
  - No construction equipment, vehicles or unauthorised personnel shall be allowed onto areas that have been re-vegetated.
- There must be no vegetation interfering with structures and statutory safety requirements upon completion of the contract;
- On completion of works, the contractor shall clear away and remove from the site all construction paint, surplus materials, foundations, plumbing and other fixtures, rubbish and temporary works of every kind.
- The construction sites shall be cleared, and cleaned to the satisfaction of the Developer and the ECO; and perimeter fencing must be removed at the end of construction in order to ensure that they do not deteriorate and result in an aesthetically unpleasing development.

Topsoil removed during the construction phase should not be stockpiled for use during the decommissioning phase, as the end of life of operations is unknown at this stage. Should topsoil be stored indefinitely, it will lose viability. All topsoil must thus be used during construction phase rehabilitation.

OPERATIONAL PHASE

No rehabilitation will be necessary during this phase. Refer to maintenance procedure above.

DECOMMISSIONING PHASE

Decommissioning of this development is not foreseen in the near future. Due to the changes in technology anticipated to occur, decommissioning phase specific rehabilitation measures will not be provided at this stage.

Prior to undertaking any decommissioning activities, impacts will be determined and management, mitigation and rehabilitation measures determined. A rehabilitation plan will also be developed prior to undertaking any decommissioning activities.

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APPENDIX 5 - TRAFFIC MANAGEMENT PLAN

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APPENDIX 6 – EROSION MANAGEMENT PLAN

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APPENDIX 7 – FIRE MANAGEMENT PLAN

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APPENDIX 8 – STORM WATER & HYDROLOGY MANAGEMENT PLAN

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APPENDIX 9 – Appendix 1 of Generic EMPr (for sub-stations) including site specific conditions.

Additional & site-specific substation conditions
MAINSTREAMING WILDLIFE INCIDENT MANAGEMENT INTO UTILITIES IN SOUTHERN AFRICA - GUIDELINE
Nest and perch deterrents designed specifically for substation hardware should also be used as preventative measures and established bird nests must be removed from substations.
Completely protect access to substations by small mammals through adequate perimeter (e.g.) electric fencing.

APPENDIX 10 – Appendix 2 of Generic EMPr (for distribution & transmission lines) including site specific conditions.

Additional & Site-Specific Distribution & Transmission Line Conditions
Hydrology Specialist Assessment
Construction phase mitigation measures
The area of disturbance should be kept to a minimum to allow clearing of the construction right of way. The width of the construction corridor should be kept to a minimum.
Vegetation should be removed only where essential for the continuation of the powerline. Any disturbance to the adjoining natural vegetation cover or soils should not be allowed.
Vegetation and soil should be retained in position for as long as possible and should only be removed immediately ahead of construction / earthworks in any specific area.
Existing roads should be used for access as far as possible.
The duration of construction activities at each pylon site should be minimised as far as is practical.
Storm water management and erosion control measures should be implemented. These should include the following:
• The excavated soil should be placed on the upstream side of construction activities in order to act as a storm water diversion berm.
• Where such diversion berms create concentrated flows, as well as in steep and/or sensitive areas (such as wetlands) the use of swales, silt fences or other effective erosion control measures is recommended to attenuate runoff.
• All storm water management measures should be regularly maintained.
Drip trays should be placed under any activity requiring active lubrication or oiling at the pylon sites.
Spill clean-up kits should be available on site for immediate remediation of any spills and removal of contaminated soils.
No fuel should be stored at the pylon sites and no refuelling or servicing of construction plant should take place at the construction sites.
No construction materials should be disposed of within the delineated wetlands or within the 100 m buffer zone on the watercourse.
No concrete batching should take place within the delineated wetlands or within the 100 m buffer zone.
All surplus spoil material from the foundation excavations (i.e. not used as backfill) should be removed from the site as soon as is practically possible.
Once construction at a pylon site is complete, the site should be rehabilitated immediately by removing all waste material. The rehabilitation specification should be determined by the soils and vegetation specialists.
All waste material should be removed to a licensed waste disposal facility, if it cannot be re-used or recycled.
In areas where construction activities have been completed and no further disturbance is anticipated, rehabilitation and re-vegetation should commence as soon as possible.
Replanting activities should be undertaken at the end of the dry season (middle to end September) to ensure optimal conditions for germination and rapid vegetation establishment.
Should plants not successfully establish within two growing seasons after the first planting, new plant material should be provided.

A weed and alien invasive species control plan should be implemented during the contract period.
Any erosion channels developing during or after the construction period should be appropriately backfilled (and compacted where relevant) and the areas restored to a condition similar to the condition before the erosion occurred.
A construction method statement should be compiled and approved prior to the commencement of construction activities.
The method statement should take cognisance of:
• The mitigation measures outlined above, as well as mitigation measures specified by each of the environmental specialists.
• The conditions of the Environmental Authorisation and Integrated Water Use Authorisation.
• The Environmental Management Program (EMPr) for the project submitted as part of the Environmental Impact Assessment Report.
The Environmental Control Officer (ECO) must ensure that the contractor adheres to the above-mentioned documents.
Operational phase mitigation measures
Existing roads should be used for access as far as possible.
The powerline route should be regularly inspected during the operational phase.
Any erosion channels developing during or after the construction period should be appropriately backfilled (and compacted where relevant) and the areas restored to a condition similar to the condition before the erosion occurred.
The following aspects need to be considered when developing a stormwater management plan:
• During earth disturbance and grading activities, disturbance of the natural topography and vegetation cover should be minimised. The natural contours should be preserved as far as is practical in order to preserve the existing site drainage patterns as far as possible.
• Correct panel level and aspect should be provided in the design of the support structures and not through earthworks.
• Utilisation of low impact construction techniques should be encouraged, with the footprint of disturbed areas being minimised.
The following principles should be applied for storm water management infrastructure, erosion and sediment control:
• Natural, dispersed, drainage should be encouraged, by maintaining the natural drainage characteristics of the land as far as possible, thereby minimising the concentration of flows and consequently the risk of erosion.
• Formal infrastructure, in the form of access roads, pipes, culverts, etc. should be kept to a minimum.
• A storm water drain should be provided along all access roads. The size and lining of the drain would be dependent on the peak flow rates and velocities, which should be determined through hydrological modelling.
• Storm water crossings at access roads should be provided in the form of drifts, rather than pipes or culverts. Drifts should be constructed from concrete or grouted stone pitching. Drifts should be provided at frequent spacings (recommendation is 300 m (Aurecon, 2014), again to minimise the concentration of flows.
All storm water drainage discharge points should be provided with outlet structures, designed with adequate erosion protection, to ensure that storm water is discharged from formal structures onto the natural ground at a safe and acceptable velocity.

A vegetation cover that at least matches the natural, pre-development cover, should be maintained at all times between and beneath the solar panels.
The following is recommended in terms of maintenance and monitoring:
• Regular visual inspections are required to identify problems as they occur.
• Reseed bare areas.
• Repair of erosion channels as soon as they develop.
• Monitoring in the form of visual inspections of the vegetation cover and erosion and sediment control features.
• Any sediment build-up should be removed immediately.
MAINSTREAMING WILDLIFE INCIDENT MANAGEMENT INTO UTILITIES IN SOUTHERN AFRICA - GUIDELINE
Wildlife incidents must be identified, defined, and categorized.
A system must be in place to report and record wildlife incidents in a central incident register (CIR). The system must investigate wildlife interaction incidents, determines the root cause/s of the problem/s, and determine appropriate recommendations to avoid reoccurrence.
Staf have the capacity to identify and report incidents, and the required resources are available to investigate and categorize incidents to the CIR when required.
Staff must be trained to identify and have a basic knowledge of species likely to interact with infrastructure in their region.
Mitigation solutions applicable to the species have been identified, and systems are in place to procure and apply these if required.
Key performance indicators are put in place to ensure that wildlife incidents are closed out quickly and efficiently.
Annual audits are conducted to ensure the efficiency of mitigation measures/ devices and determine if there were any reoccurrence of incidents and confirm closeout.
Fit markers to the earth wire or conductors to improve their visibility to birds in flight.
Illuminate conductors and earth wires for nocturnal birds that fly during periods of low light to reduce recurring power line collision mortality.
Utilise electrical components with safer designs and implement wildlife 'friendly' power structures which maximize the separation between phases and earthed components. For horizontally configured phase designs (e.g., a distribution t-pole), suspending the outer phases below the cross-arm of a power pole greatly improves phase-to-phase separation. For vertical configurations, the vertical separation between phases should be increased to safe levels. Utilities can use angled beams or brackets to make it difficult for birds to perch near energized or earthed components comfortably, thereby discouraging their use of the pole/tower. However, caution should be taken when using these, as they may also provide an angle where nests can be built next to the main pole.
Supplemental perches can be used to lure birds away from parts of a tower or pole where phase-to-phase electrocutions are likely, or where their presence introduces a risk of an air gap breakdown (bird electrocutions occur when the air gap between two energized components, is physically breached by a bird, leading to a short-circuit).
Perch deterrents, such as 'bird guards', prevent birds from perching over critical components such as insulator strings and are, to some extent, successful when implemented correctly. No perch deterrent caters equally well for all species, and utilities must first identify the culprit species in a specific area before deciding on the perch deterrent to use.
Due to increased pollution and the risk of flashovers from conductive materials, the removal of bird nests may be necessary where they have been constructed on or above critical components of power pole/ tower structures. The removal of bird nests from

structures should be guided by the internal best practice guidelines for each power utility and general guidelines recommended in documents such as those by the Avian Power Line Interaction Committee (APLIC) (2006). These suggest that active bird nests should not be removed unless the species involved have been positively identified and the utility has the necessary permits to do so. When nest removal is not possible and not recommended due to the species involved, a nest may be moved to another, more favourable location on a pole or tower. As suggested above, is it not recommended that this be done when a nest is still active, as birds are known to abandon their brood in the event of such significant disturbance.
A nest deterrent is a device intended to prevent birds from building or rebuilding a nest on critical positions of a pole/tower, such as directly above a conductor insulator or insulator string. Specific devices are not appropriate for all structure designs, nor all bird species; thus, tailor-made solutions may be necessary.